WORLD PETROLEUM

SEPTEMBER, 1944

AGAIN GENERAL CHEMICAL CREATES
NEW FACILITIES AT CHICAGO, ILLINOIS
FOR ANHYDROUS HF TO SERVE AMERICAN INDUSTRY!
From Anhydrous HF

···*FIGHTING FUEL* for FIGHTING PLANES!

General Chemical Company—long a major producer of Sulfuric Acid and Oleum—offers Anhydrous Hydrofluoric Acid to all alkylate producers using this catalyst.

As one of America's largest manufacturers of Fluorine compounds, General Chemical is in a particularly advantageous position to furnish your requirements . . . as evidenced by its long experience in the manufacture of Hydrofluoric Acid, and the fact that it produces from its own raw materials. Your inquiries are cordially solicited . . . no obligation, of course!

* * *

. . . One more example of General Chemical Research keeping in step with war needs *and the technological advances of the Petroleum industry!*

GENERAL CHEMICAL COMPANY
40 RECTOR STREET, NEW YORK 6, N. Y.

Technical Service Offices: Atlanta · Baltimore · Boston · Bridgeport (Conn.) · Buffalo Charlotte (N. C.) · Chicago · Cleveland · Denver · Detroit · Houston · Kansas City Milwaukee · Minneapolis · New York · Philadelphia · Pittsburgh · Providence (R. I.) St. Louis · Utica (N. Y.)

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SPECIAL CHEMICALS

Anhydrous Hydrofluoric Acid is one of *many* chemicals which has recently sprung into a position of prime industrial importance. If you are interested in this material for *any* use, please feel free to let us know.

Cooperating with industry toward furnishing *"special"* chemicals in commercial quantities *is part of our service to American enterprise.* If you are using such chemicals, it will pay you to investigate General Chemical's service in furnishing your requirements!

ACCURATE

Check . . . recheck . . . check again! Nothing left to chance. From raw materials to finished product, every step of the way, each Tube-Turn welding fitting is subjected to many routine inspections that are designed to insure accurate dimensions and conformity to American standards.

Bevels, inside and outside diameters, interior surfaces, wall thickness, finish, all must meet Tube Turns' standards of accuracy. Small wonder that Tube-Turn welding fittings help to make piping systems lower in upkeep costs, and more efficient. Write for Catalog 111 — now!

If you don't have one, write today for the new booklet "Allowable Working Pressures."

Selected Tube Turns Distributors in every principal city are ready to serve you from complete stocks.

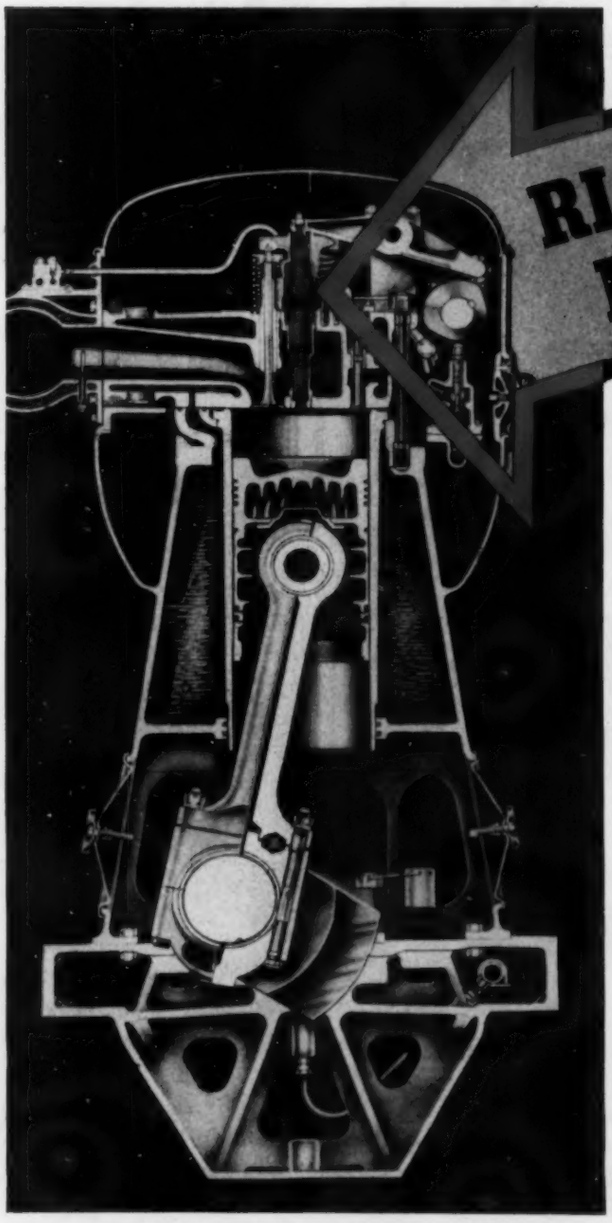
TUBE TURNS (Inc.) Louisville, Kentucky. Branch Offices: New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Houston, San Francisco, Seattle, Los Angeles.

TUBE-TURN

TRADE MARK

Welding Fittings and Flanges

WORLD PETROLEUM (including Petroleum Equipment Exporter) Vol. 15 No. 10, September 1944. Entered as Second Class Matter at the Post Office at New York, N. Y. under the act of March 3, 1879. Application pending transfer as Second Class Matter to the Orange, Conn. Post Office. Published monthly August to June, semi-monthly in July, at Boston Post Road, Orange, Conn. by Mona Palmer Trustee under the will of Russell Palmer, at 2 West 45th Street, New York 19, N. Y. Subscription price $5.00 a year, single copies 50 cents each.



RIGHT WHERE IT BELONGS!

The unit-type fuel injector in Hendy Diesel Engines is right in the head...*logically* placed for satisfactory service under all load conditions, with *uniform* high-pressure fuel charge to *each* cylinder. This injection system provides individual fuel pumps for each cylinder...does away with long, high-pressure fuel lines... simplifies service because the entire unit can be easily removed for cleaning.

In addition to the unit-type fuel injector you'll find other important features too, such as...overhead camshaft, direct actuated dual intake and exhaust valves, and hydraulic tappets. All these features, *combined for the first time in a single engine,* reduce the number of wear points, simplify service and contribute directly to the lower maintenance costs a successful Diesel operator must have.

In marine service—or for stationary duty—Hendy Diesels can serve you well. They combine two great qualities...all the ruggedness for rough seas; all the good features for low-cost operation.

Hendy Diesels for marine or industrial service... 6 or 8 cylinders, 350 to 675 hp... are also available with Hendy generators as complete electric generating plants.

Hendy is currently supplying 250 kw Diesel generating sets for a large number of AVI cargo ships.
HENDY
DIESEL
ENGINES
50

Write today for complete data—ask for the New Hendy Series 50 Diesel Engine Catalog.

JOSHUA HENDY IRON WORKS

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51-D-3

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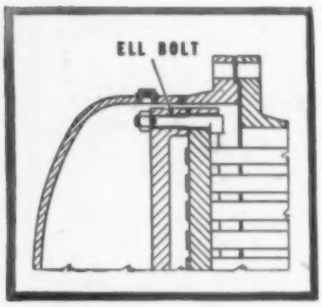
ELL BOLT
CONSTRUCTION
a feature of the Patented
VOGT HEAT EXCHANGER
Floating Tube Sheet Assembly



Patent Nos.
1,895,735
2,232,478

Assures
NO LEAKS HERE

YOU LOSE when an exchanger leaks . . . . with the possibility of fluid contamination, or shut down for repairs.

None of these evils need plague you when you employ the Vogt patented floating tube sheet assembly because there is no distortion of a split ring to worry about in making up the joint time after time. Its easy to make tight and it stays tight!

Critical materials are saved too because the design makes possible a smaller diameter of shell through reduction of the dead space between the shell and the tube bundle.

Our new bulletin HE-5 is a pictorial presentation of standard and special types of Vogt Heat Exchangers. Write for a copy on your letter head.

Saves
FLUID CONTAMINATION
•
FREQUENT SHUTDOWNS
•
CRITICAL MATERIALS

BUY WAR BONDS

HENRY VOGT MACHINE COMPANY
Incorporated
LOUISVILLE 10, KENTUCKY
Branch Offices: New York, Philadelphia, Cleveland, Chicago, Dallas.

Vogt *Heat Transfer* **EQUIPMENT**

X-ray marks the spot!

SPOT? SPOTS to the Nth degree would be more accurate! For to date X-rays covering more than fifty-five thousand feet of continuous field welding have been taken by the M. W. Kellogg Welding Control Section.

This tremendous task is just one undertaken to provide an independent, qualitative double-check on structural perfection in the field. And this ability to spare no detail in refining construction—where details are legion and vital—helps to explain why this company has been chosen again and again to do the job.

X-ray field welding control is a clue, too, to the flexibility of thinking and procedure that characterizes Kellogg construction. For when the size of modern vessels outstripped transportation facilities . . . this company pioneered field welding to metallurgical laboratory specifications.

Such flexibility has built an organization under *one* roof capable of raising the world's ultra-modern refinery on the site of virgin forest. America's 100-Octane Colossus at Lake Charles stands witness. Far beyond basic girders, piping and vessels . . . Kellogg construction engineers have the seasoned experience that takes in its stride, literally anything and everything to make a refinery function—railroad spurs, docks, chimneys, power plants, housing, sewers, concrete construction. And under these construction engineers are permanent crews geared to operate world-wide.

But as leading refiners will tell you—construction is only one phase of M. W. Kellogg Complete* Service. We evolve the required engineering data. We apply it. We develop process methods. We design. We erect the plant. We supervise initial operation. And every phase is fused to meet two interlocking aims: Total war production now; the initial advantage in post-war competition for our customers.

THE M. W. *KELLOGG* COMPANY

Only Kellogg Service Has Them All

★**LABORATORIES**—fully equipped and staffed—devoted exclusively to chemical engineering and process development.

★**24-HOUR-A-DAY PILOT PLANTS**—17 refining processes operating continuously—providing accurate data for commercial scale application.

★**EXCLUSIVE CHEMICAL ENGINEERING DATA**—Continuously compiled . . . embracing both pilot plant runs and the operation of Kellogg-built refineries. Data extends from beginning of modern refining.

★**PROCESS ENGINEERS**—Specialists who have continuously made major contributions to oil refining development, for more than 20 years . . . currently exemplified by their work on fluid catalytic-cracking.

★**MECHANICAL ENGINEERS**—Kellogg installations—worth hundreds of millions—are their best reference.

★**METALLURGICAL LABORATORY**—Establishes continuous check of specifications...creates new techniques for the fabrication of refining equipment.

★**PERMANENT CONSTRUCTION CREWS**—Geared to function all over the world on single units or multiphase refineries . . . team-experience cuts costs, speeds construction.

★**OPERATING STAFFS**—Specialists at placing new units "on stream" . . . training of refiner's own operating crews.

★**LICENSING SERVICE**—Licenses available through Kellogg as Licensor or licensing agent for all types of refining processes.

225 Broadway, New York 7, N. Y. • Jersey City, N. J. • 609 Grand Ave., Los Angeles, Calif. • Phillower Bldg., Tulsa, Okla • 402 Esperson Building, Houston 2, Texas • Stone House, Bishopsgate, London, EC2

OILING THE WAR

Speed, under present abnormal conditions, has become even more a vital factor in the search for oil. Drillers everywhere are depending on Hughes Bits for maximum speed in drilling straight, full-gage hole.

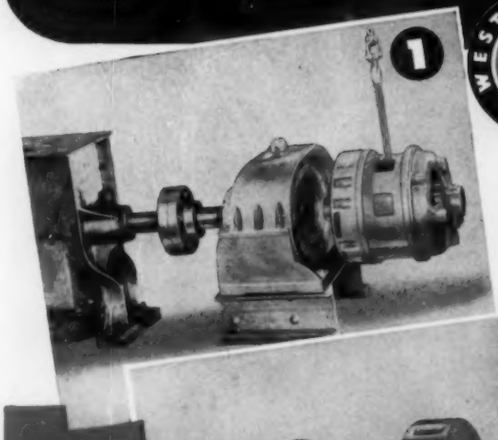
HUGHES TOOL COMPANY HOUSTON, TEXAS

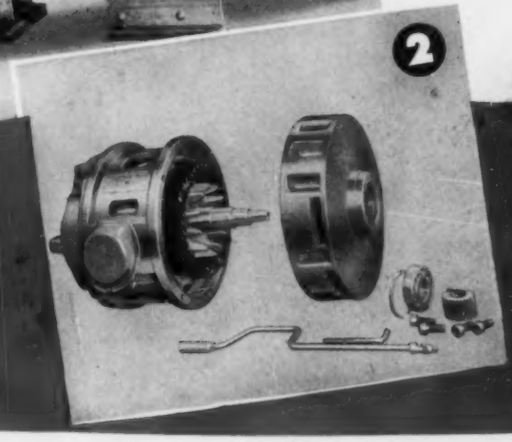
A Better Drive for Slow Stroke Pumping

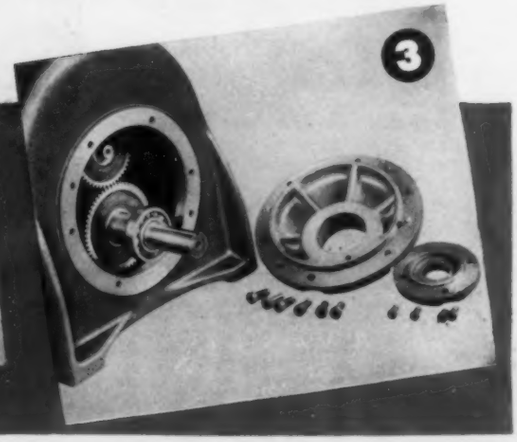
WESTINGHOUSE

HERE'S HOW VITAL PARTS OF THE NEW GEARMOTOR CAN BE REACHED QUICKLY

1. **DETACH THE MOTOR.** Foundations of gearmotor and driven machine need not be disturbed.
2. **INSPECT MOTOR PARTS.** Removing adapter reveals interior of motor for checking insulation, etc.
3. **REMOVE END PLATE** of Single Reduction Gearmotor and gearing parts are ready for inspection.







-SEE HOW EASY IT IS TO INSPECT AND MAINTAIN IT!

THE MAINTENANCE MAN likes the new Westinghouse Gearmotor because all working parts are accessible. The pictures below show how easy it is to inspect or replace gearing and motor parts. Since the Westinghouse Gearmotor has fewer moving parts, there are fewer parts to wear... maintenance is at a minimum. Many parts are interchangeable between unit types, reducing replacement stock by as much as forty percent.

WESTINGHOUSE GEARMOTORS are designed to provide compactness, simplicity and efficient operation. They are obtainable in ratings from ¾ to 75 hp at output speeds of 1550 to 4.4 rpm in single, double and triple reductions. Weatherproof construction is available for outdoor application.

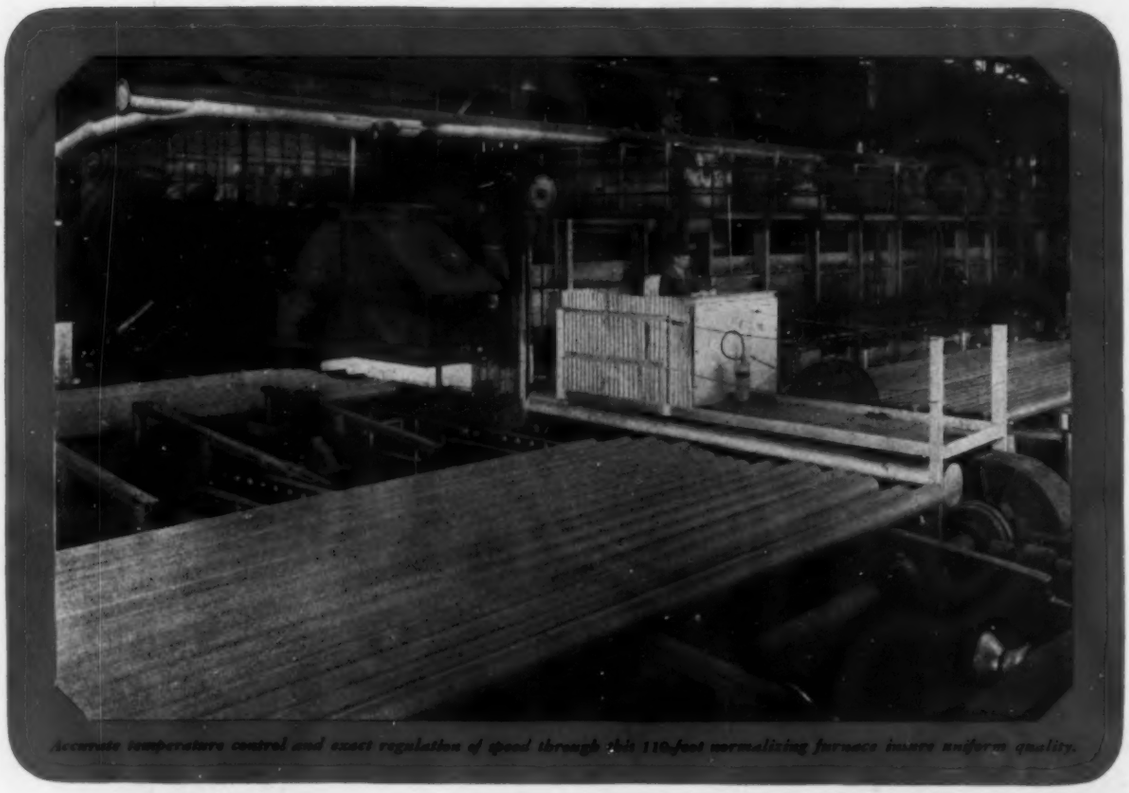
For detailed information, write for the Gearmotor book. Westinghouse Electric International Company, 40 Wall Street, New York 5, U. S. A.

Westinghouse Gearmotors

4. **UNBOLT END CAP** of the Double Reduction Gearmotor, to inspect bearings. Next . . .

5. **LIFT OFF COVER.** Case is split horizontally at shaft centers for complete accessibility. Finally . . .

6. **LOOSEN INNER BEARING BRACKET.** Gear assemblies can now be inspected, removed or replaced.



Accurate temperature control and exact regulation of speed through this 110-foot normalizing furnace insure uniform quality.

NORMALIZING *means* UNIFORM STRENGTH

—insurance against underground failures!

Now, when steel is scarce, you can make it go farther by using casing that affords high protection against failures.

Every length of Republic Casing is normalized. It produces a refined grain structure that means *UNIFORM* yield strength, ductility and hardness. It gives the casing wall *UNIFORM* resistance to collapse under severe pressures.

Every Republic production line has its special processes and tests that assure a high degree of quality and uniformity in all Republic oil country products. They help to produce the better performance which has made Republic Alloy Steels, Electric Weld Line Pipe, Electrunite Heat Exchanger Tubes and Upson Quality Studs, Bolts and Nuts favored in the oil fields.

To get more for *your* casing dollars, rely on the field-proved quality, demonstrated by more than 50,000,000 feet of Republic Electric Weld Casing and Tubing in service.

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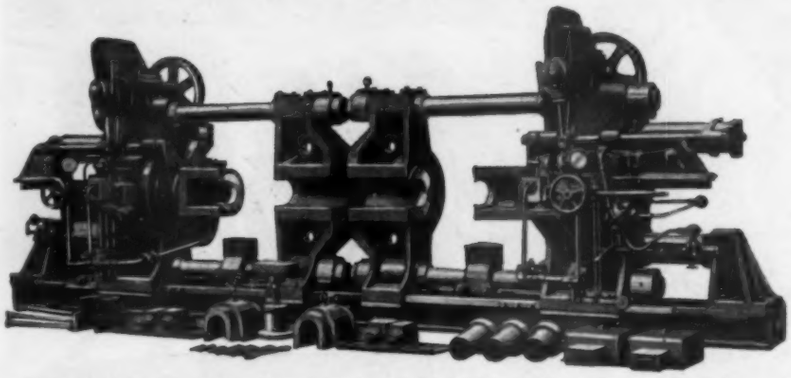
REPUBLIC *Electric Weld*
LINE PIPE
NORMALIZED CASING AND TUBING

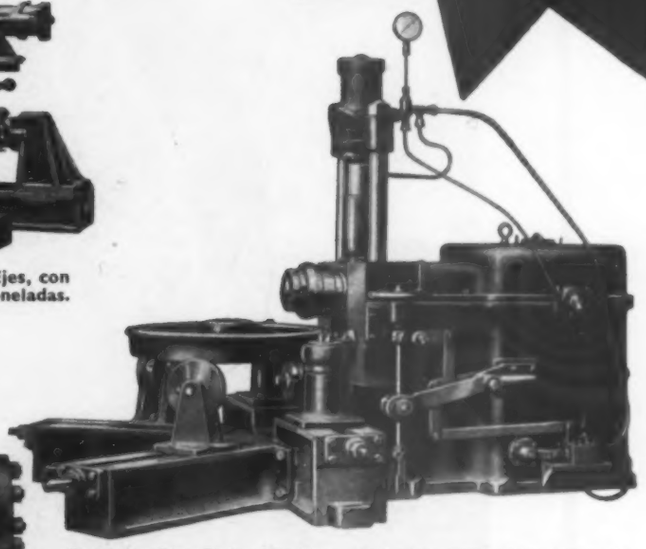
THE RESULT OF 50 YEARS EXPERIENCE ON THE RAIL ROADS OF THE WORLD

Railway Workshop Tools



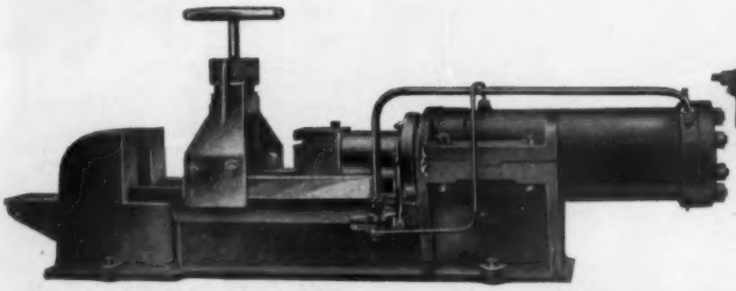
Universal Wheel and Axle Press with Special Tools. 400 Tons.

Prensa Universal para Ruedas y Ejes, con Herramientas especiales. 400 toneladas.



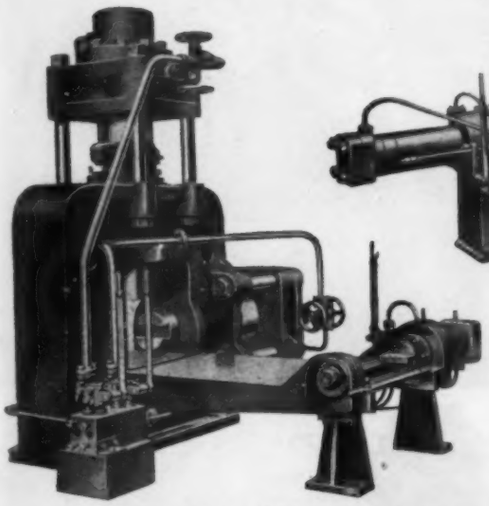
Retaining Ring Fixing Machine Hydro-Electric.

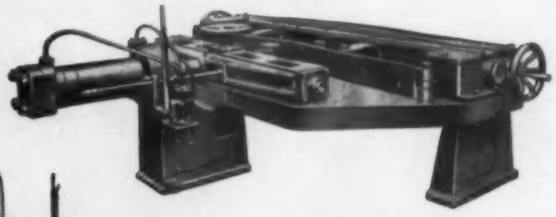
Máquina para Fijar Aros de Sujeción. Hidroeléctrica.



Spring Buckle Stripping Press. 60-100 Tons.

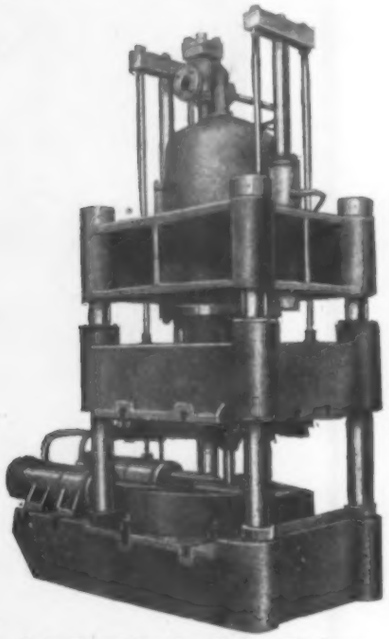
Prensa para Desguarnecer Bridas de Resortes. 60-100 toneladas.





Spring Plate forming Press. Variable Camber.

Prensa para Formar Placas de Resorte. Comba variable.



Axle Guard forming Press. 300 Tons.

Prensa para Formar Guías de Ejes. 300 toneladas.

Spring Buckling and Assembling Press. Triple Power 33-66-100 Tons.

Prensa para Hacer y Montar Bridas de Resortes. Potencia triple. 33-66-100 toneladas.

HENRY BERRY & Co LTD. Leeds ENGLAND

DESIGNERS AND MANUFACTURERS SINCE 1885

PROYECTISTAS Y FABRICANTES DESDE 1885

California

A recent California Pressure Maintenance installation . . . Richfield's Cole's Levee Plant . . . Six CLARK 600 H. P. Super-2-Cycle gas-driven "Angles"

PRINT IN BL

HERE WE COME!

73,040 H.P.

OF CLARK "ANGLES" TO CALIFORNIA IN 4 YEARS . . . HALF OF IT IN 1943

CLARK Compressors have had wide acceptance in California, due to their fine record there for continuous operation.

When the demand for compressors for Hi-Octane Gasoline developed, CLARK delivered the goods. Not a single shipment has been late.

Today, with the advent of deeper fields and lighter crudes, California operators are producing large volumes of gas and are in position to make use of the advantages that accrue from pressure maintenance. CLARK deliveries to California in the past 4 years, principally for refinery and pressure maintenance service, have totalled 73,040 Horsepower. Half of that total was shipped in 1943.

7 CLARK 1000 H. P. gas-driven "Angles" in refrigeration service in a California refinery

12 CLARK 7500 H. P. gas-driven "Angles" in service in California's Synthetic Rubber Industry

2 CLARK 3000 H. P. steam-driven "Angles" in California refinery making Hi-Octane Gasoline

One of the Dresser Industries

CLARK BROS. CO., INC.
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Export Offices: 30 Rockefeller Plaza, New York. Domestic Sales Offices and Warehouses: Tulsa, Okla.; Houston, Tex.; Chicago, Ill. (122 S. Michigan Ave.); Boston, Mass. (Park Square Bldg.); Huntington Park, Calif. (5715 Bicket St.) Foreign Offices: London, England; Avda Roque Saenz Pena, 832, Buenos Aires.

CLARK Sets the Pace in Compressor Progress

NT IN BINDING

AFTER VICTORY—

Flying Horsepower

AT THE SIGN OF FRIENDLY SERVICE

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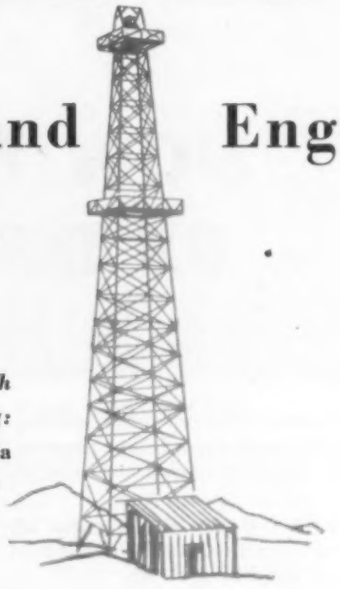
Mobilgas • Mobiloil Mobilubrication • Mobil Specialties

DRILLING CONTRACTORS

Geologists and Engineers



We are now operating or have operated in North American and South American Countries including:
Eastern, Mid-Continent, Gulf Coast and California Fields of U. S. A. and in CANADA and MEXICO and in BRAZIL, COLOMBIA, PERU and VENEZUELA

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DRILLING AND EXPLORATION COMPANY, INC.

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LOS ANGELES 44, CALIFORNIA

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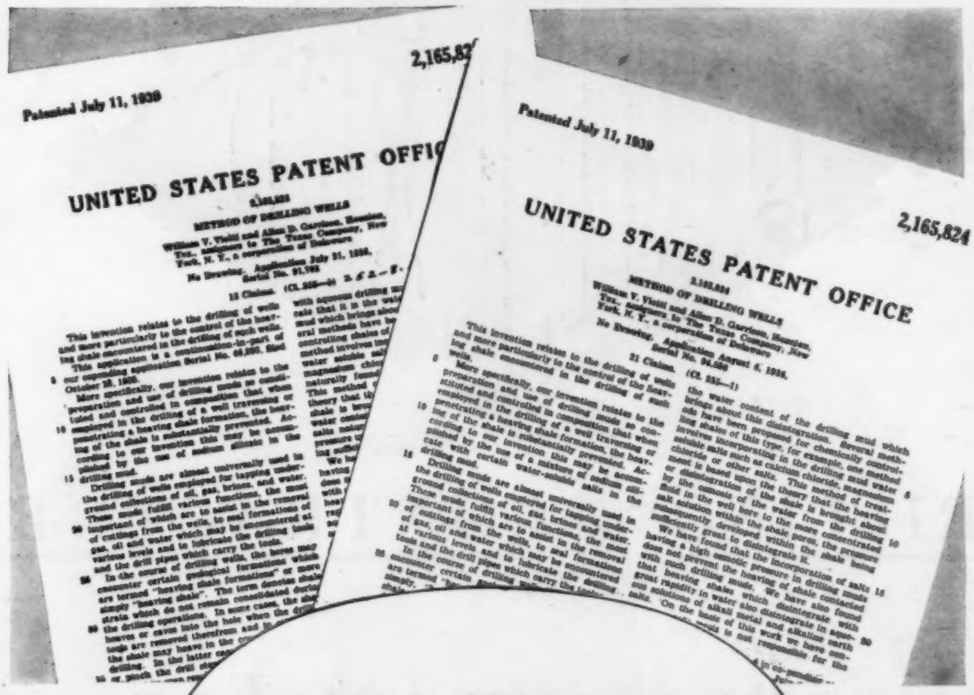

Patented July 11, 1939

UNITED STATES PATENT OFFICE

2,165,824

METHOD OF DRILLING WELLS

William V. Vietti and Allen D. Garrison, Houston, Tex., assignors to The Texas Company, New York, N. Y., a corporation of Delaware

No Drawing. Application August 6, 1934, Serial No. 739,280

21 Claims. (Cl. 255—1)

This invention relates to the drilling of wells and more particularly to the control of the heaving shale encountered in the drilling of such wells.

More specifically, our invention relates to the preparation and use of drilling muds as conditioned and controlled in composition that when employed in the drilling of a well traversing or penetrating a heaving shale formation, the heaving of the shale is substantially prevented. According to our invention this may be accomplished by the use of sodium silicate in the drilling mud.

Drilling muds are almost universally used in the drilling of wells employed for tapping underground collections of oil, gas, brine, and water. These muds fulfill various functions, the most important of which are to assist in the removal of cuttings from the wells, to seal formations of oil, gas, oil and water which may be encountered at various levels and to lubricate the tools. Various levels and to lubricate the tools. the drill pipes which carry the bits, and the drill pipes which carry the bits, the latter may

In the course of drilling wells, it frequently encounter certain geological formations which are termed "heaving shale formations" or more simply "heaving shale". The term denotes shale strata which do not remain consolidated during the drilling operations. In some cases, the shale heaves or caves into the hole when the drilling tools are removed therefrom and in other cases the shale may heave in the latter case, after drilling. In the latter case, after drilling, the drill

NOW IT CAN BE DRILLED

ARCH enemy of the oil driller, heaving shale has blocked drilling progress in many important fields and wildcat areas.

It has forced the abandonment of countless operations, often with the loss of part of the drilling string.

Unstable in the presence of water, heaving shale swells and disintegrates, pushing into the well. Thanks to the Texaco method of heaving shale control, it is no longer an insuperable obstacle.

By employing the sodium silicate fluid developed by The Texas Company, the structure is consolidated thereby preventing this heaving action.

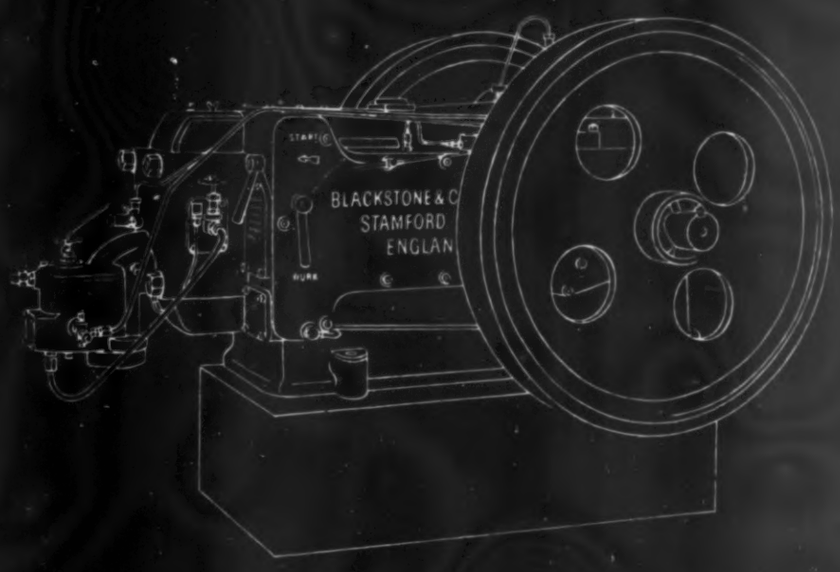
By this method, relatively deep wells have been completed by practically every major oil company in the Gulf Coast area. No other method has achieved this success. Licenses for the use of this development are available from Texaco Development Corporation or Philadelphia Quartz Company.

TEXACO DEVELOPMENT CORPORATION

A Subsidiary of The Texas Company

26 Journal Square • Jersey City, N. J.

BLACKSTONE



OIL ENGINES FOR OILFIELDS

Blackstone self-contained single cylinder hopper-cooled Diesel. All working parts are totally enclosed by dustproof covers and force-lubricated. Hand-starting is easy thanks to the positive decompressor gear, and the standard driving pulley can be fitted on either side of the engine. Speed can be adjusted over a wide range when running. In short, a compact, well-balanced power unit, specially designed for all classes of portable and semi-portable equipment. Ranges are 10 to 24 B.H.P. at 500 to 650 R.P.M.

All Blackstone engines are fitted with Listard (Van der Horst patents) chrome hardened cylinder liners.

BLACKSTONE AND CO LTD STAMFORD ENGLAND

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quality petroleum products
for War and Peace

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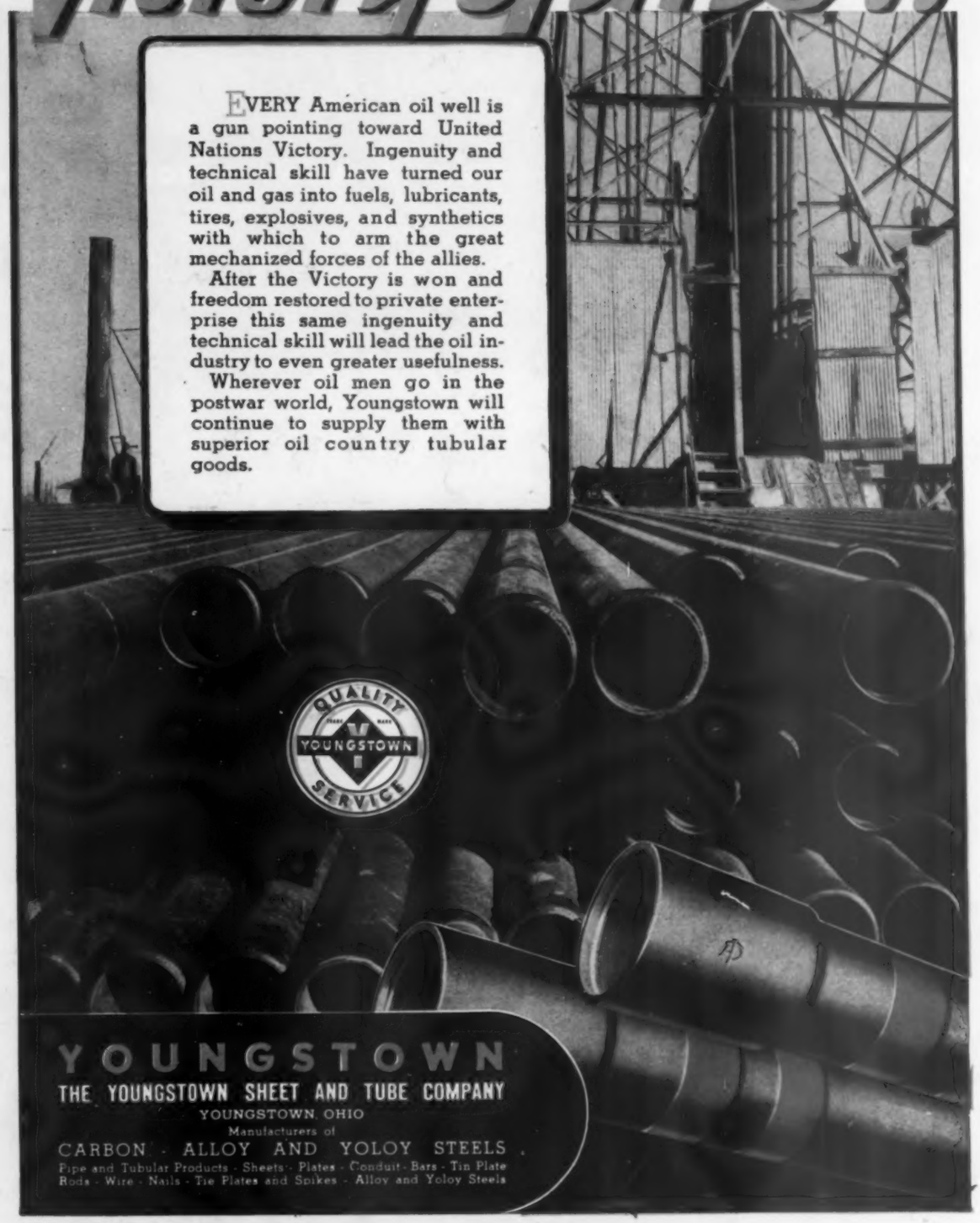
Victory Guns . .



EVERY American oil well is a gun pointing toward United Nations Victory. Ingenuity and technical skill have turned our oil and gas into fuels, lubricants, tires, explosives, and synthetics with which to arm the great mechanized forces of the allies.

After the Victory is won and freedom restored to private enterprise this same ingenuity and technical skill will lead the oil industry to even greater usefulness.

Wherever oil men go in the postwar world, Youngstown will continue to supply them with superior oil country tubular goods.

QUALITY · YOUNGSTOWN · SERVICE

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

YOUNGSTOWN, OHIO

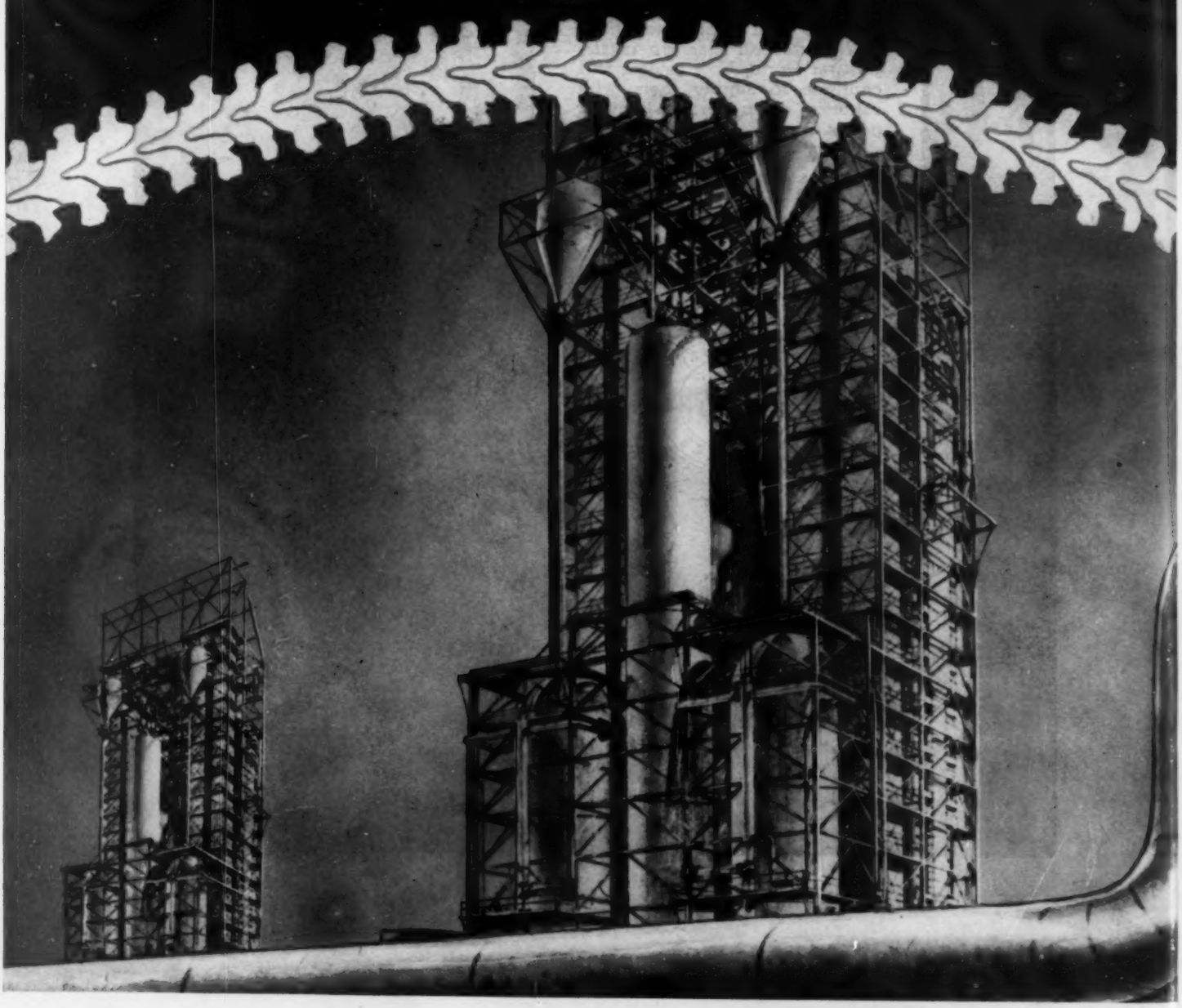
Manufacturers of

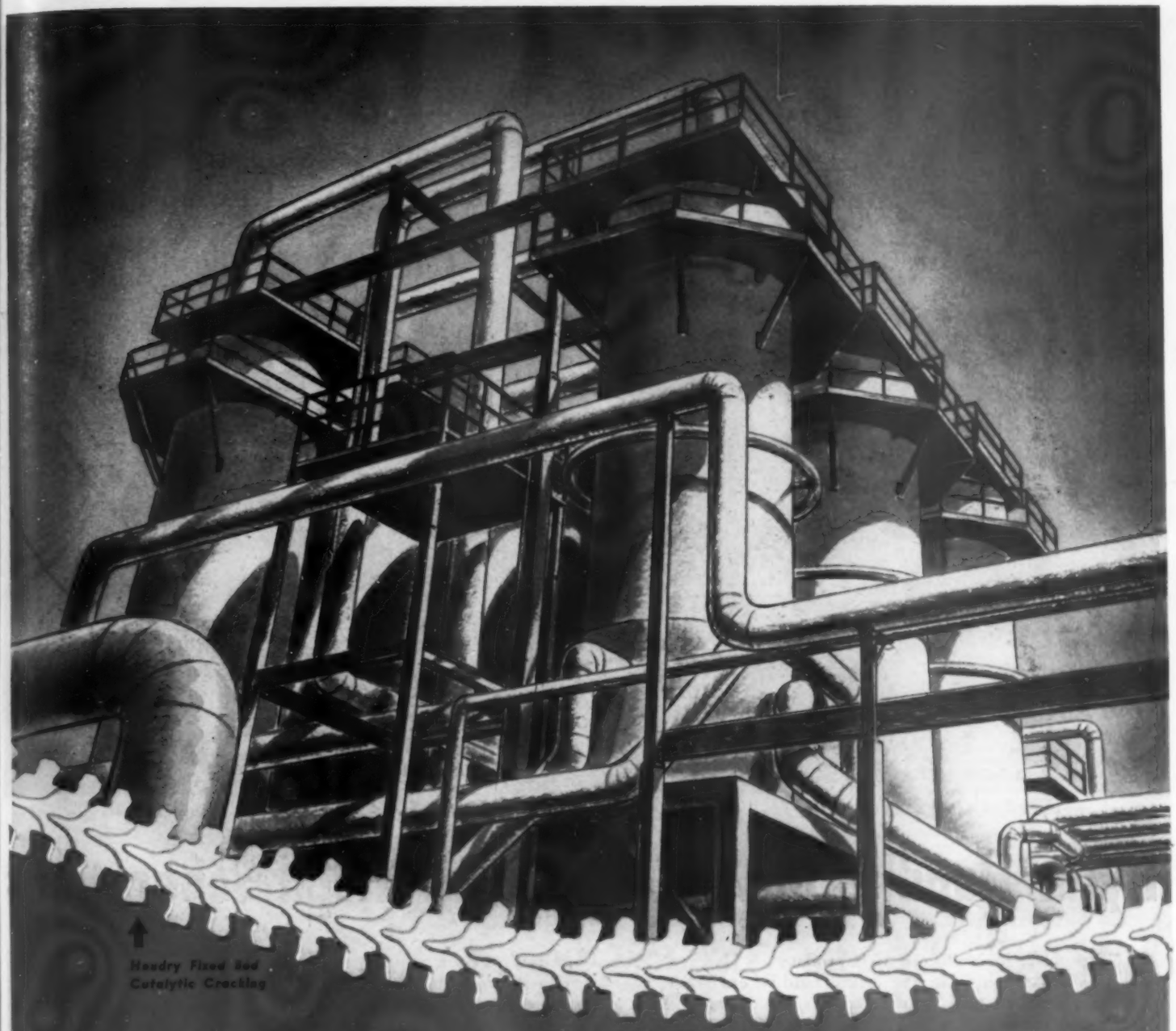
CARBON · ALLOY AND YOLOY STEELS

Pipe and Tubular Products - Sheets - Plates - Conduit - Bars - Tin Plate
Rods - Wire - Nails - Tie Plates and Spikes - Alloy and Yoloy Steels

CATALYTIC CRACKING

. . . THE BACKBONE OF THE 100-OCTANE AVIATION GASOLINE PROGRAM





Houdry Fixed Bed
Catalytic Cracking

BY SUPPLYING in constantly accelerating quantities the major components of 100-octane fuel, *Catalytic Cracking* has made possible the great Allied aerial offensives. *Catalytic Cracking* will continue in pace with the increasing crescendo right on to V-Day! And just as surely, *Catalytic Cracking* will help in the post-war and peace economy!

Badger's part in this program covers the entire period from the world's first commercial catalytic cracking units, through the engineering improvements resulting in the current Houdry Fixed Bed Units to the latest applications in Thermofor Catalytic Cracking.

This experience represents a backlog of "know how" not available to any other single organization. It ranges from catalysts and problems specific thereto — to engineering application — to final products.

E. B. Badger & SONS CO., BOSTON 14 EST. 1841

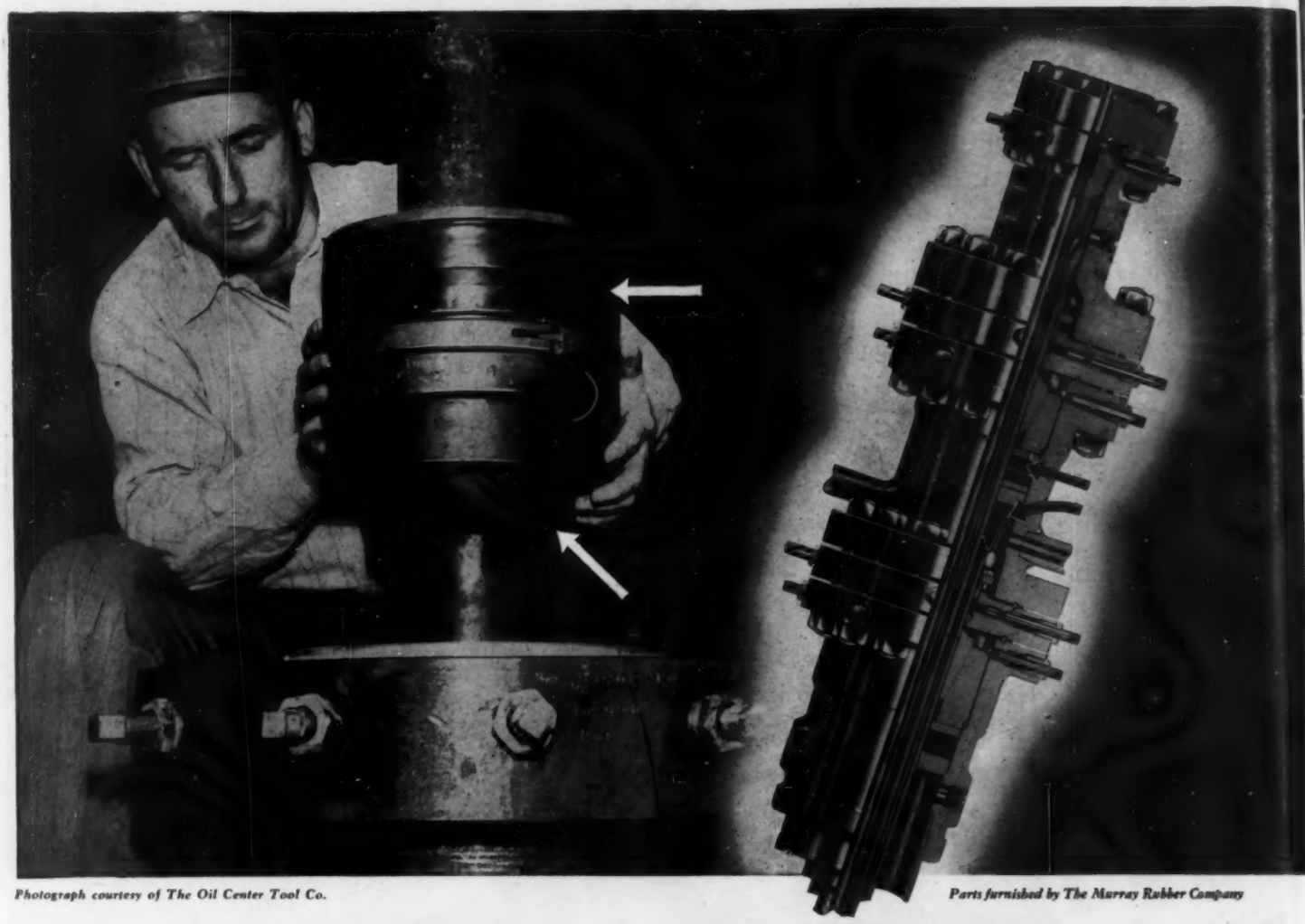
NEW YORK · PHILADELPHIA · SAN FRANCISCO · LONDON

Process Engineers and Constructors for the Petroleum, Petro-Chemical and Chemical Industries

Thermofor
Catalytic Cracking

* Licensing Agents for the Houdry Catalytic Cracking Processes and the TCC Process.

BADGER-DESIGNED AND BADGER-BUILT UNITS HAVE PRODUCED MORE CATALYTICALLY CRACKED GASOLINE THAN ALL OTHERS COMBINED.



Photograph courtesy of The Oil Center Tool Co.

Parts furnished by The Murray Rubber Company

Hycar Handles Multi-Zone Casing Head Separations

ONE problem in Multi-zone well production separation is in the casing head where the resilient packing material has a difficult and tricky job to do. For example, recently in several wells in one Gulf Coast field the packing material had to separate dry gas under 3800 lbs. pressure p. s. i. and high gravity distillate flowing under 3000 lbs. pressure p.s.i. To handle this difficult situation Hycar was selected by The Oil Center Tool Company for use in its "C-9-D" Casing Head. The upper arrows in the illustration point to two hinged rings of Hycar resilient packing, while the lower arrows show the Hycar stripper type packoff. Both types are constantly exposed to oil and/or gas upon the completion of a well.

Hycar was selected for this job because of its established superiority in resistance to petroleum products. Hycar is a well-known name in oil fields where its petroleum and acid-resistance, its abrasion-resistance and its high tensile strength have made it the ideal material for gate packers in mud line valves, oil well tubing packers, coal rings, packing for well heads, gaskets and many other products where these properties are vital.

Ask your supplier to furnish you parts made of Hycar for actual tests in your own applications. Learn for yourself that Hycar can help reduce operating costs—that it's wise to use Hycar where the going gets tough. *Hycar Chemical Company, Akron 8, Ohio.*

WHAT HYCAR DOES IN OIL FIELD APPLICATIONS

1. Resists oil and gas—even under high pressure.
2. Resists action of abrasive-laden fluid under high pressure and moving at high velocity.
3. Wears at slow rate even under worst conditions.
4. Makes a positive, leak-proof seal, even after a long period of service.
5. Provides high elasticity.
6. High tensile strength.
7. Minimum tendency to cold flow and compression set.

Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

Synthetic Rubber

Correct pronunciations and meanings of commonly used synthetic rubber names and terms are given in the new pocket-size Hycar Glossary. Write for free copy.

PUT THE BIT
ON
TARGET
SEISMIC
SUBSURFACE SURVEYS
SEISMIC EXPLORATIONS, INC. • GULF BLDG. • HOUSTON, TEXAS

So sorry, Sons of Heaven

The most important prisoners the Japanese ever captured were the rubber trees of the East Indies and Malaya. From them, America derived 98% of her rubber; and without rubber, we might have lost the war.

But America has rubber—synthetic rubber produced right here in America, safe from Japanese attack.

Eighty per cent of the vitally important synthetic rubber being made here is a type our scientists made available to America, and developed here. Rubber made from petroleum products.

Some 1,500 people are continuing petroleum research in our great laboratories, and from their work will come even more new uses for oil and even better petroleum derivatives.

STANDARD OIL COMPANY (NEW JERSEY)

AND AFFILIATED COMPANIES

2 New IDECO SWIVELS

To SPEED Your Drilling-

5 New Features Bring You Additional Advantages at No Extra Cost

You'll want to see these new Ideco Swivels before you buy again.

They're field-designed for the practical driller. Note these improvements. . . 3½" fluid passage is unrestricted throughout. . .stem can be withdrawn without removing lower couplings. . . . rubber bumpers are easily renewed by removing a single bolt. . . wash pipe and packing can be replaced quickly. Wash pipe replacements at low cost. And, exclusive with IDECO--cylindrical type mainthrust bearings, for long life. A bearing that will drill for years without replacement. Field-proven thru years of use.

Furnished in two sizes- 250 ton and 300 ton.

Be sure to get these new features on your next swivel--especially as you pay no more.

THE INTERNATIONAL DERRICK & EQUIPMENT CO.
COLUMBUS, OHIO

How Ideco's two new Swivels speed your drilling is described in this new Catalog. Write for it or obtain from any Ideco sales office or supply store.

Ideco Stores Are "One-Source" Centers for Supplies, Equipment and real Service.

MORE NEW IDECO PRODUCTS COMING. WATCH FOR THEM.

IDECO

Baroid Products

• Operators who use Baroid Products regularly in all their wells find that this is an economical procedure because it minimizes many drilling difficulties and speeds up drilling. In addition to this, the safety provided by the use of Baroid Products many times proves of inestimable value.

Baroid Products meet all drilling conditions in deep or shallow wells. Baroid Laboratories at Houston, Los Angeles and Tulsa improve the qualities of these Products by constant research. Baroid Service Engineers, in laboratory-equipped cars, are on duty in all active oil fields. Baroid, and other Baroid Products, are available in more than 400 locations in the United States and Canada.

PATENT LICENSES, unrestricted as to sources of supply of materials, but on royalty bases, will be granted to responsible oil companies and operators to practice inventions of any and/or all of United States Patents Numbers 1,807,082; 1,991,637; 2,041,086; 2,044,758; 2,064,936; 2,094,316; 2,119,829; 2,214,366; 2,294,877; 2,304,256 and further improvements thereof. Applications for Licenses should be made to Los Angeles office.

BAROID PRODUCTS

BAROID: Drilling Mud Weighting Material.
AQUAGEL: Gel-Forming Colloidal Drilling Clay.
IMPERMEX: An Extra High Yield, Organic Colloid.
BAROCO: A Salt-Water-Resisting Drilling Clay.
ZEOGEL: A Special Clay to Be Used as a Suspending Agent When High Concentrations of Salt or Salt Water Are Encountered.
MICATEX: A Material for Reducing Water Loss to the Formation; Overcoming Mild Losses of Circulation.
FIBROTEX: A Fibrous Material for Restoring Lost Circulation.
AQUAGEL CEMENT: Cement Containing AQUAGEL Improves Cement Jobs and Speeds Recovery of Lost Circulation.
STABILITE: A Superior Chemical Mud Thinner.
SMENTOX: Material for Overcoming the Effect of Cement-Contamination in Mud.
ANHYDROX: A Material for Preventing and Overcoming the Effect of Gypsum and Anhydrite Contamination in Drilling Muds.
TESTING EQUIPMENT: Apparatus for Making Complete Field and Laboratory Examinations of the Properties of Drilling Mud.
BAROID WELL LOGGING SERVICE: Formation Information Through Mud Analysis.

BAROID SALES DIVISION

NATIONAL LEAD COMPANY

BAROID SALES OFFICES: LOS ANGELES 12 • TULSA 3 • HOUSTON 2

BAROID • AQUAGEL • STABILITE • OIL WELL DRILLING MUD SERVICE

ECONOMICAL DEPENDABLE & LONG LASTING

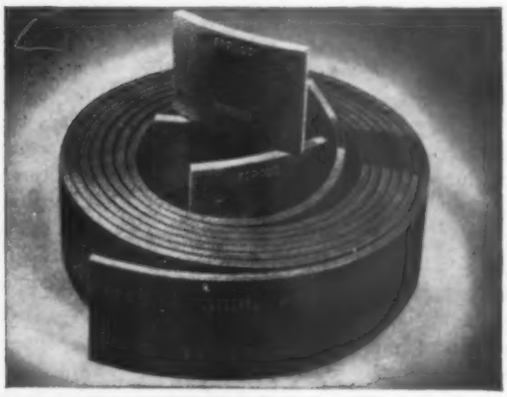
CONTINUOUS SERVICE UNDER ARDUOUS CONDITIONS PROVES THE SUPERIOR QUALITY OF FERODO FRICTION LININGS

The old mill-wheel turns year after year, performing its task without need for constant adjustment and costly repair. It symbolises unfaltering duty, economical service.

Lasting service is nowhere more necessary than in the operation of drawworks brakes where, in drilling, exceptionally heavy duty is imposed. Poor friction materials mean frequent renewal, loss of working hours and consequent high operating costs.

Ferodo Friction Linings will provide the long enduring service you need. Made to the highest quality standard in rolls or formed to drum diameter they are supplied with co-efficients of friction that remain constant under working conditions.

Give Ferodo Friction Linings a trial and these facts will be confirmed. Full details from our agents.



F E R O D O

FRICTION LININGS

Agents—**ARGENTINE, URUGUAY and PARAGUAY :** Anderson Levanti and Co., S.R.Ltda., Alsina 471/485, Buenos Aires. **CANADA :** J. C. McLaren Belting Co., 620, Beaumont Street, Montreal. **PERU :** Milne and Co., S.A.Lima. **U.S.A. :** Ferodo and Asbestos Incorporated, New Brunswick, New Jersey. **INDIA :** Asbestos Cement, Ltd., Mulund, Bombay. **TRINIDAD :** F. J. Miller and Co., 30, Richmond Street. Port of Spain. *FACTORY REPRESENTATIVE* in Chile, Peru, Bolivia, Equador and Columbia : A. Dodson, Casilla 2130, Santiago, Chile.

INSIST ON FERODO LININGS FOR BRAKE EFFICIENCY REGD. TRADE MARK FERODO

Their business is to help keep your business going

• *Big, well-equipped service shops enable "Caterpillar" dealers to offer their customers the last word in maintenance and repair service.*

• *In this dealer's repair shop, every kind of "Caterpillar" equipment receives the attention it needs in the hands of skilled mechanics.*

"CATERPILLAR" owners are fortunate in having a dependable service-dealer organization to which they can turn for expert inspection, adjustments and repair work at a time when obtaining new equipment is virtually out of the question—except for the most essential needs.

That your "Caterpillar" dealer is able to provide such services, despite the fact that his showrooms may be empty, is due to sensible long-range planning. His dealership has been established on the sound principle that doing business successfully is not alone a matter of making sales, but of *keeping sold equipment in good operating condition —come what may*.

During the long war years, your "Caterpillar" dealer has been steadily on the job—geared to come through for you. In fact, his shop is likely better equipped to serve you than ever before, with more factory-trained service men, finer equipment and the latest methods to save time, money and war-critical materials in keeping your machines at work. His desire now, as always, is to make your business more profitable and he is equipped to make that wish come true.

Have your "Caterpillar" service-dealer go over your equipment *now*—for inspection, adjustments, and replacement or repair of worn parts. In this way, not only can your operating costs be kept at a minimum, but the life of the equipment can, most likely, be prolonged by thousands of hours.

• • •

CATERPILLAR TRACTOR CO., PEORIA, ILL., U. S. A.

THE "FIGHTING FOUR"

INSPECT Look your equipment over frequently. For expert "internal" inspection of operating parts or functions, call in a trained "Caterpillar" service man. Read your Operator's Instruction Book.

LUBRICATE Use the right oil at the right time in the right place and in the right quantity. Keep the oil clean—change before it becomes dirty and deteriorated. Follow the Operator's Instruction Book.

ADJUST Tighten all bolts. Keep fan belt and tracks at proper tension. Read the Operator's Instruction Book. For fuel injection valves and other precision adjustments, let your experienced service dealer do the work. He'll do it well.

REPLACE Have your service-dealer replace or repair worn bearings, track, rollers, pins and bushings, sprockets, cylinder liners, clutch linings. His service helps restore power and extend equipment life. Saves critical materials, too.

DEPENDABLE is the word for "Caterpillar" dealers

CATERPILLAR DIESEL

REGISTERED TRADE-MARK

TRACTORS—ENGINES AND ELECTRIC SETS—EARTHMOVING MACHINERY

Powell's Past ...your assurance of Future Performance

Fig. 1793—Large size Iron Body Bronze Mounted Gate Valve for 125 Pounds W. S. P. Has flanged ends, outside screw rising stem, bolted flanged yoke, bronze seat rings and taper wedge solid disc. Also available with double disc—Fig. 1444.

Fig. 1460—Iron Body Bronze Mounted "Master Pilot" Gate Valve for 150 Pounds W. S. P. (¼" to 2") and 125 pounds W. S. P. (2½" to 4".) Has screwed ends, bolted flanged bonnet and taper wedge solid disc.

For every problem in flow control, there'll always be a POWELL Valve to lick it!

Powell Valves for controlling flow in your industry were not just "born"—they're a product of evolution—the result of nearly a century of patient study, research and experimentation by Powell's staff of Engineers and Metallurgists. Therefore you can be sure TODAY that TOMORROW—as in the past—there'll be Powell Valves to meet every existing requirement for dependable flow control. Shown here are some POWELL Valves especially adapted for use in water, steam and air lines. The complete Powell Line includes all types of valves (Globes, Angles, Gates, Checks, Ys, etc.) not only in bronze, iron and steel but also in a wide variety of pure metals and special alloys to meet every requirement of the Petroleum Refining Industry for corrosion resistance.

The Wm. Powell Company

Dependable Valves Since 1846

Cincinnati 22, Ohio

Fig. 190—Iron Body Bronze Mounted Globe Valve for 150 Pounds W. S. P. Has screwed ends, union bonnet, and regrindable, renewable nickel-bronze seat and plug type disc.

Write Dept. F, for our new booklet—"Powell Valves for Corrosion Resistance"

Fig. 241—Large size Iron Body Bronze Mounted Globe Valve for 125 Pounds W. S. P. Has flanged ends, outside screw rising stem, bolted flanged yoke and regrindable, renewable bronze seat and spindle-guided disc.

POWELL VALVES

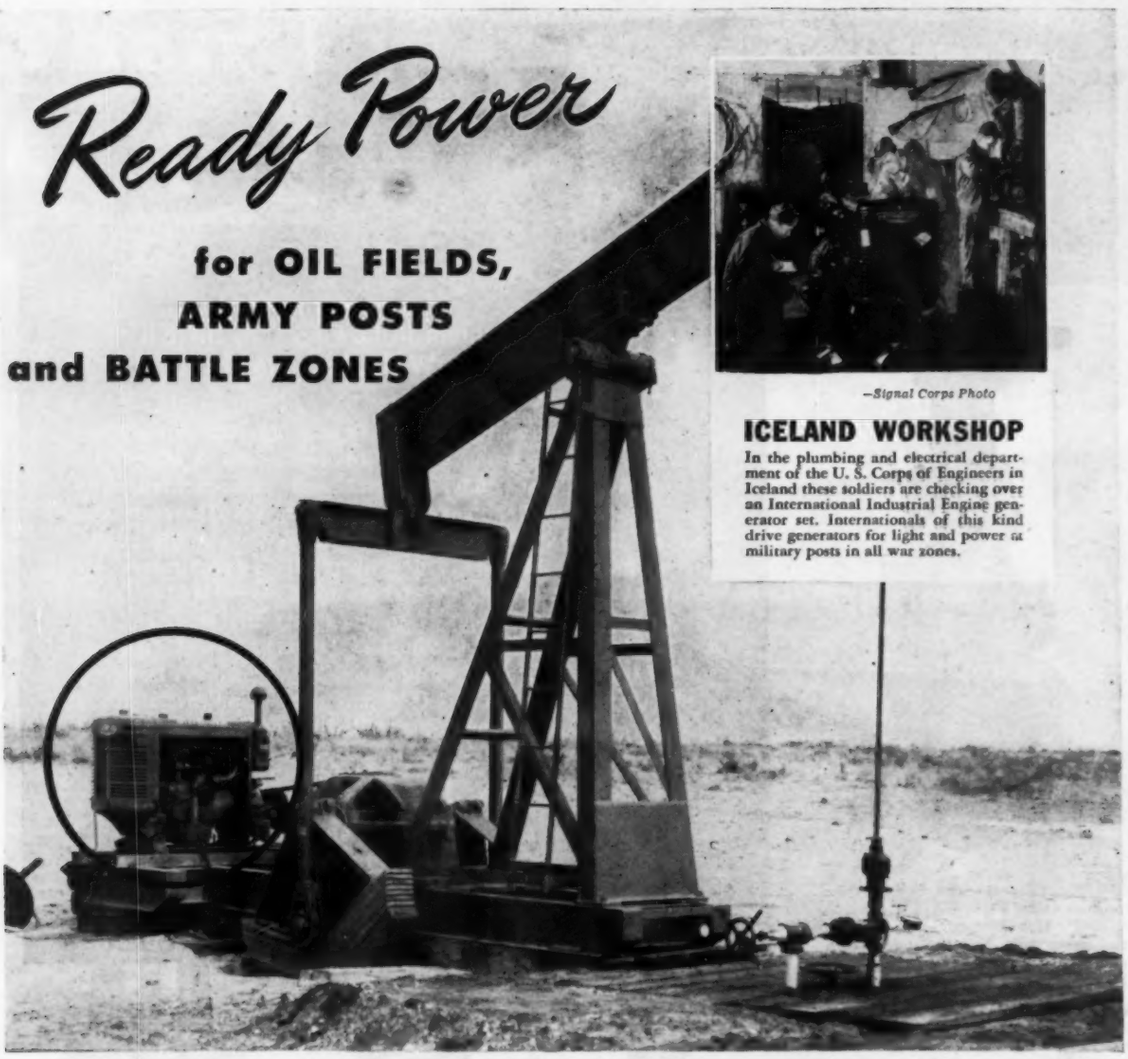
Ready Power

for OIL FIELDS, ARMY POSTS and BATTLE ZONES

—*Signal Corps Photo*

ICELAND WORKSHOP

In the plumbing and electrical department of the U. S. Corps of Engineers in Iceland these soldiers are checking over an International Industrial Engine generator set. Internationals of this kind drive generators for light and power at military posts in all war zones.



FOR CONTRAST, here are two International Industrial Engines, in two widely separated locations, doing two very different jobs.

On the other hand, these engines have much in common. Both are supplying dependable, easy-starting, all-weather power. And more important, *both are doing a war job* — one by pumping precious oil, the other by generating power and light for GI Joes in Iceland.

Release of new International Engines is limited today to essential war work. See the nearest International Industrial Power distributor for information. Meanwhile, take good care of your Internationals. Keep them properly serviced. Equipment conservation, always important, *is doubly so for the duration.*

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

OUR JOB TODAY . . . fight on the food front . . . give to the blood bank . . . buy extra War Bonds . . . fight inflation . . . for VICTORY.

INTERNATIONAL ENGINES
Power for Victory . . . Power for Peace

12,314 Feet—

OF THE WORLD'S DEEPEST WELL *WAS CHECKED WITH THE*

E EA-SY C INCLINOMETER

E-C
INCLINOMETER

An E-C was rented to Phillips Petroleum Company when they started operations on their PRICE NO. 1 well in Pecos County. This rental began August 11th, 1942 and was in service one year, the depth of the well upon cancellation being 12,314 feet. The use of the E-C Inclinometer was discontinued when too great a depth was reached to use the measuring line operation in connection with the E-C Inclinometer.

The E-C is a truly great instrument for recording hole deviation. Operated by dry cell batteries on sound electro-chemical principles. Self-checking, speedy in operation and no timing device needed. Operates on ordinary measuring line. Multiple recording is easy—with permanent records instantly available. Low in rental charge and operating cost.

POLAR CORE ORIENTATIONS

A typical sample core

Sperry-Sun also made two "core orientations" on this Price No. 1 Well. One core was sent in on June 30th, 1943 and was taken from the depths of 11,621 to 11,639 feet. The second was taken between 14,536 and 14,550 feet and was sent in on March 21, 1944.

Sperry-Sun's Core Orientation service is of immense value in wild-catting, inasmuch as it may indicate the direction of dip of the strata encountered. The service is rapid, inexpensive and very accurate. Details sent on request.

OTHER SPERRY-SUN INSTRUMENTS AND SERVICES

SURWEL CLINOGRAPH • H-K INCLINOMETER • M-M-O BOTTOM HOLE ORIENTATION
SYFO CLINOGRAPH • H-K SINGLE SHOT • K-K WHIPSTOCK

SPERRY-SUN WELL SURVEYING CO., 1608 WALNUT ST., PHILA. 3, PA.

Eagles...

. . . HAVE VORACIOUS APPETITES

The airplane is the eagle of war, and the American eagle is swift, sure and deadly—with a hearty appetite for fuel.

A single 1000-plane raid on Berlin consumes 1,600,000 gallons of gasoline.

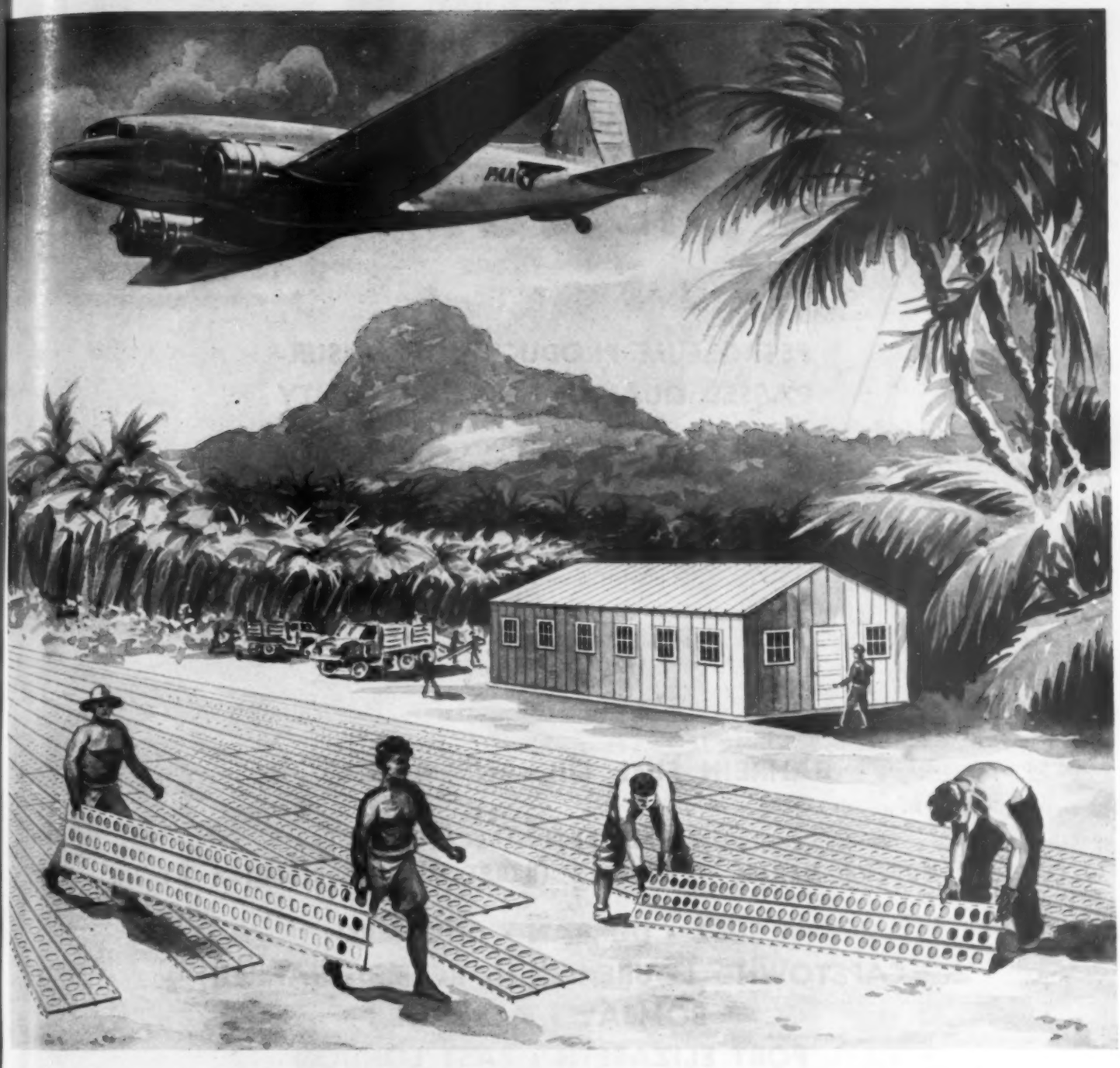
It is not enough to refine the fuel, or carry it to foreign shores. When eagles fly, they demand on-the-spot nourishment, and to provide it the Corps of Engineers builds portable pipe lines leading from central depots to active fronts.

Gaso workmen, recently awarded the cherished Army-Navy "E", play an important part in the operation of these lines. They build the pumps that move the oil that powers the eagles of victory . . . Gaso Pump & Burner Mfg. Co., 902 East First Street, Tulsa, Oklahoma. Export Office: 149 Broadway, New York. Shreveport: W. L. Somner Co., 419 Lake Street. Los Angeles: Service Oil Field Supply Co., 5333 S. Riverside Drive.

GASO

FOR EVERY OIL INDUSTRY NEED

Pumps fuel to fighting fronts!



Springboard to Victory

From scores of secret airports in remote parts of the world, men and vital supplies are flown to our Allied fighting fronts to the south, north, east, and west.

The *steel landing mat* is composed of countless steel sections that lock together. Many thousands of such steel landing mat sections made of U·S·S steel helped establish strategic air bases around the globe. This magic carpet of pierced steel planks can be laid quickly, transforming a sandy beach or a lush tropical clearing into a full-fledged airfield.

To satisfy field requirements in any theatre of operations—to meet the need for a readily erected or dismantled general-utility building to ship in minimum space, UNITED STATES STEEL designed the pre-cut *Task Force Building*. Offering many variations in sizes and arrangements, these portable buildings are well insulated, completely weather-tight, leakproof, and resistant to any outside fire hazard. Adapted to service in varying extremes of climate from the Arctic to the tropics, they will last indefinitely if properly maintained.

United States Steel—the world's largest steelmaker—now serves the United Nations with war products. After Victory, the superior qualities of U·S·S steels will again be available for every peacetime activity of oil field and refinery.

UNITED STATES STEEL EXPORT COMPANY
30 CHURCH STREET, NEW YORK 8, U.S.A.

WE SERVE THE WORLD with superior steels from the world's largest steelmaker

PLANE SHOWN THROUGH THE COURTESY OF PAN AMERICAN WORLD AIRWAYS

CALIFORNIA TEXAS OIL COMPANY LTD.

★ ★ ★

PETROLEUM PRODUCTS OF UNSURPASSED QUALITY AND UNIFORMITY

. . . developed by extensive refinery and research organizations . . . backed by years of efficient practical performance

Distributed in all important points in the Far East, India, Egypt, Australasia, South and East Africa.

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BAHREIN FUEL OIL AND DIESEL OIL

CONVENIENTLY LOCATED
MODERN MARINE TERMINALS INSURE PROMPT DISPATCH AT

SUEZ • DURBAN • COLOMBO
CAPETOWN • LOURENCO MARQUES • BAHREIN
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EXPERT TECHNICAL SERVICE

OFFICES IN U. S. A.
130 East 43rd Street
New York, N. Y.

Cable Address: "CALTEX, N. Y."

On High Pressure Pipelines like this

LADISH *Controlled Quality* FORGED STEEL FLANGES ASSURE WELDABILITY

In producing forged steel flanges for all types of pipeline service, the rigid metallurgical control exercised by Ladish Drop Forge Co. assures that welding requirements will be met.

On installations like these, where varying conditions exist, Ladish green colored *Controlled Quality* Forged Steel Flanges can be depended upon for unfailing service.

Upon request, and by referring to the Ladish *heat code* permanently stamped on every flange, the user can obtain certified reports of the analyses of the steel from which the flange was forged.

Steel identity stamped on each flange was pioneered by Ladish and has been a Ladish standard for many years

ARMY E NAVY

FITTINGS DIVISION

LADISH DROP FORGE CO.

CUDAHY • WISCONSIN

MILWAUKEE SUBURB

New York Office: 60 East 42nd Street, New York City

TO MARK PROGRESS

You get optimum output when research, engineering and catalyst come from the same source

Houdry catalysts are tailor-made to suit varying types of operations and charging stocks. Houdry's highly developed technique of laboratory evaluation analyzes samples of the licensee's stock and determines precisely the proper catalyst, thus assuring maximum efficiency and highest possible yield.

HOUDRY CATALYTIC PROCESSES
... FOR VICTORY IN WAR AND PROGRESS IN PEACE

HOUDRY PROCESS CORPORATION
WILMINGTON, DELAWARE

Houdry Catalytic Processes and the T.C.C. Process are available through the following licensing agents to all American refiners, subject to approval by the United States Government.

E. B. BADGER & SONS CO.
Boston, Massachusetts

THE LUMMUS COMPANY
New York City, New York

BECHTEL-McCONE CORP.
Los Angeles, Calif.

STEEL BRIDGES
OF EVERY TYPE AND SIZE

DORMAN LONG & CO. LIMITED
MIDDLESBROUGH, ENGLAND

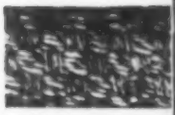
London Office:
Terminal House, or Grosvenor Gardens
S.W. 1

DORMAN LONG

PRINT IN BINDI
Vessel
Electric Welded Steel Pipe
Fractionating Tower
Ball Mill
Kingposts for Merchant Ships
nnel Shield
"A" Frame for
Cargo Vessel
Contactor
Reflux Drum
Settler Tank

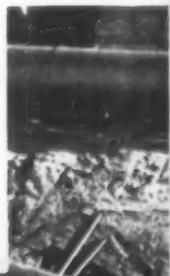
IN BINDING

Tower



oper Tower

Ball Mill



ALCO–One of the Leading U. S. Fabricators of Alloy and Steel Plate Work

ALCO fabricates pressure vessels in any size, of any metal, carbon steel, alloy, or clad metal. Welded, annealed and X-rayed.

For any specified pressure, temperature, or corrosion factor.

ALCO's expert shopmen know how to roll plate to close tolerances—edges precisely aligned, uniformly meeting, dependably welded.

ALCO metallurgists apply exacting physical and chemical tests in a thoroughly equipped ALCO laboratory.

ALCO pressure vessel men know that quality layout, as well as skillful assembly and welding, is essential to a good pressure vessel job.

In handling your work, ALCO will fabricate from your drawings and specifications, or will design and specify as well as fabricate, as you prefer.

ALCO builds fabricating towers, fractionating columns, coking drums, stills, scrubbers, agitators, absorbers, pressure tanks, retorts, stabilizers, evaporators, reactors, converters, accumulators.

Other heavy plate work handled by ALCO includes large diameter steel pipe, penstocks, tanks, tunnel shields, kilns, and the like.

Representative examples of ALCO jobs in these categories are here pictured.

Ask ALCO to quote on your job.

American Locomotive

ALCO PRODUCTS DIVISION

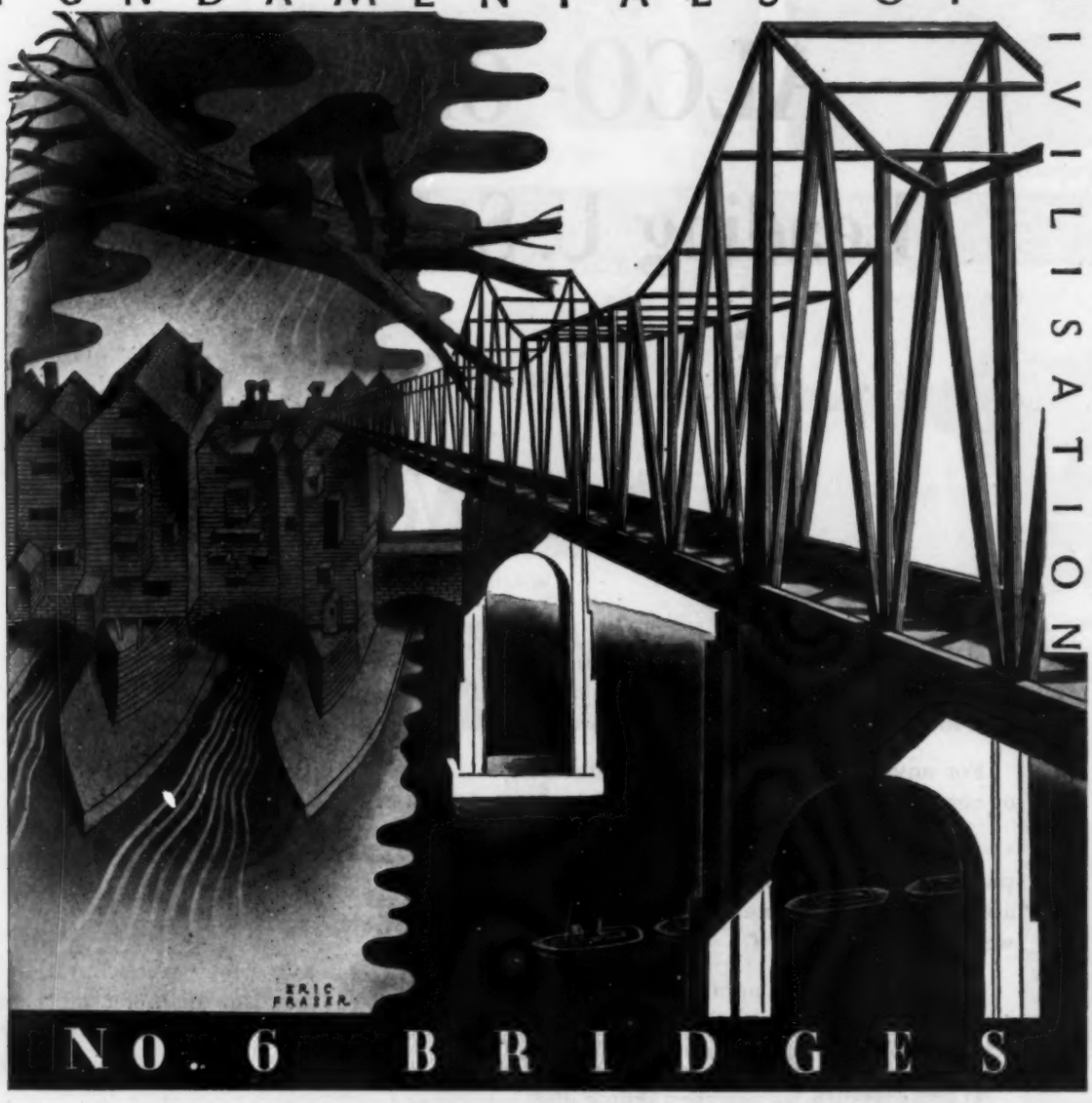
HEAT EXCHANGERS • PRESSURE VESSELS • PREFABRICATED PIPING

30 Church Street, New York 8, N. Y. • Dunkirk, N. Y.

Rotary Cement Kiln

Electric Welded Steel Pipe

FUNDAMENTALS OF CIVILISATION



NO. 6 BRIDGES

The origin of the bridge is lost. Was the first bridge a fallen tree, torn from its roots by the tempest and flung across the torrents. Did stone arches evolve from some linking of stepping stones with stone slabs in time of flood? Development was slow because of the limitations imposed by materials. The result was, however, the picturesque timber structure and the graceful stone arched bridge. Such bridges aided movement by land but were a hindrance in the waterways because their spans were, of necessity, short.

THE UNITED STEEL COMPANIES LTD

Steel revolutionised construction and enabled the engineer to leap across the widest river. In this present age the cantilever, suspension, arched span, plain girder, lattice girder, swing, transporter and reinforced concrete bridges all depend on steel and all facilitate communications between communities which is the essence of civilisation.

THE UNITED STEEL COMPANIES LIMITED

STEEL, PEECH & TOZER, SHEFFIELD
SAMUEL FOX & CO. LTD., SHEFFIELD
UNITED STRIP & BAR MILLS, SHEFFIELD

APPLEBY-FRODINGHAM STEEL CO. LTD., SCUNTHORPE
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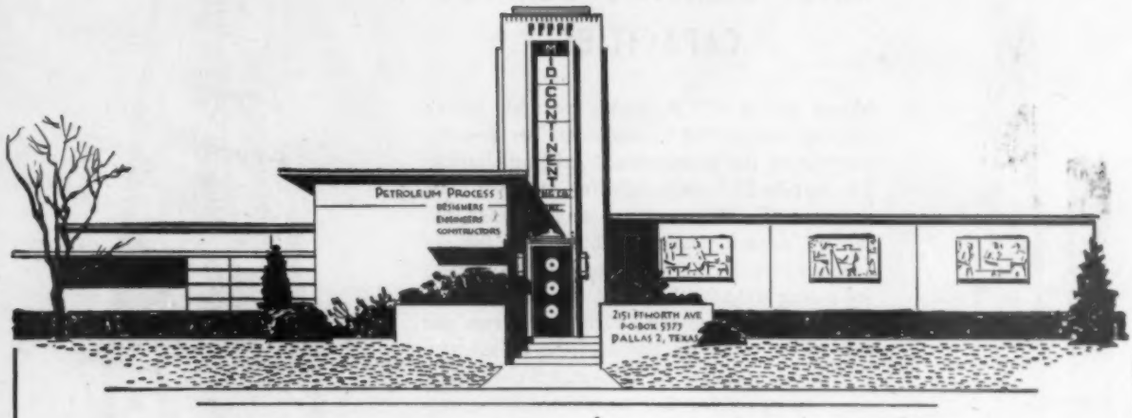
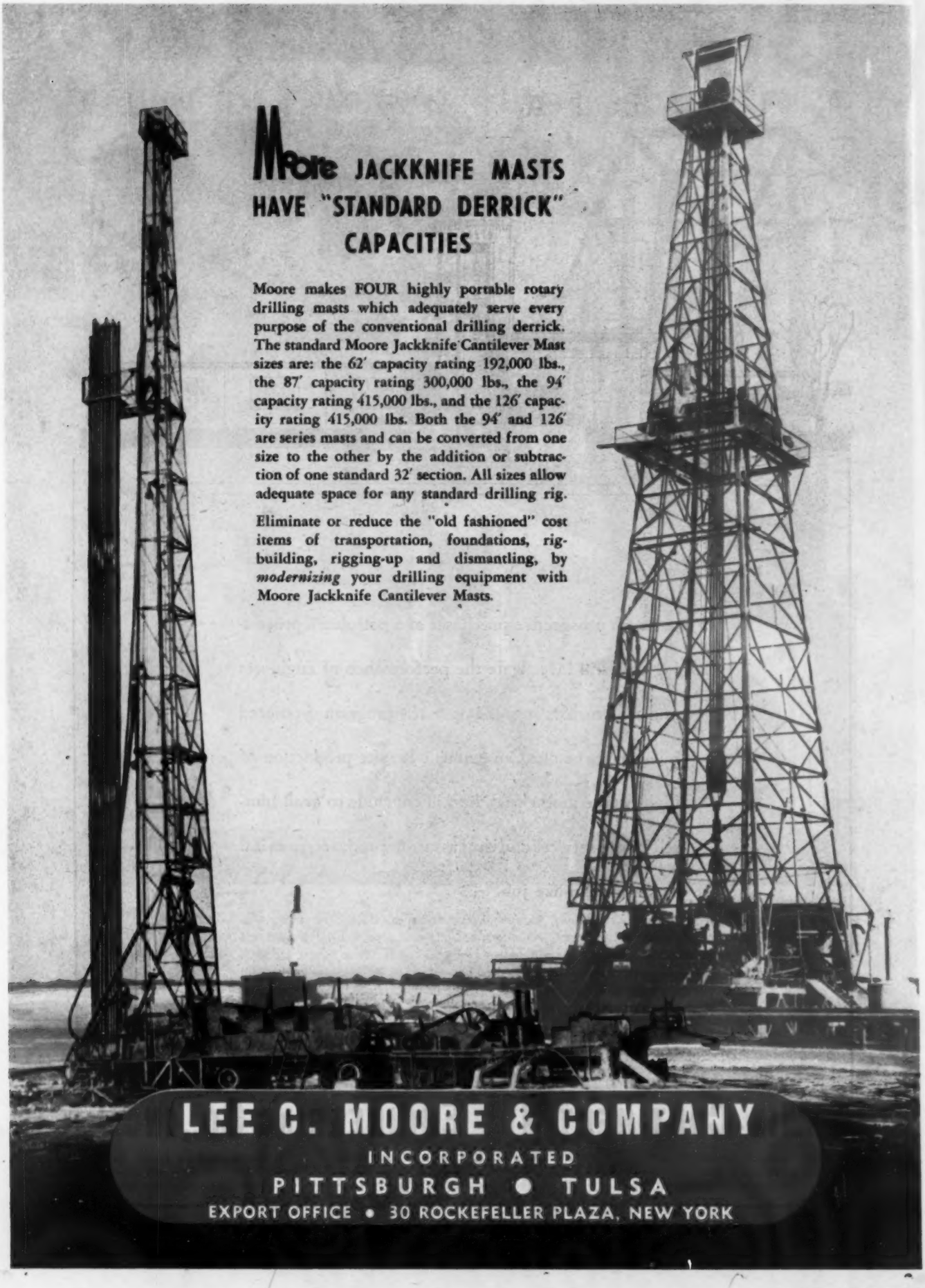


If each prospective purchaser of a petroleum processing unit will investigate the performance of engineers and constructors engaged upon the program sponsored by agencies of our Government for the production of high octane motor fuel, he will conclude to avail himself of our services and thus assure a speedy, economical and workman-like job.

MID-CONTINENT ENGINEERING CO., INC.

DALLAS TEXAS


Moore JACKKNIFE MASTS
HAVE "STANDARD DERRICK"
CAPACITIES
Moore makes FOUR highly portable rotary drilling masts which adequately serve every purpose of the conventional drilling derrick. The standard Moore Jackknife Cantilever Mast sizes are: the 62′ capacity rating 192,000 lbs., the 87′ capacity rating 300,000 lbs., the 94′ capacity rating 415,000 lbs., and the 126′ capacity rating 415,000 lbs. Both the 94′ and 126′ are series masts and can be converted from one size to the other by the addition or subtraction of one standard 32′ section. All sizes allow adequate space for any standard drilling rig.
Eliminate or reduce the "old fashioned" cost items of transportation, foundations, rig-building, rigging-up and dismantling, by *modernizing* your drilling equipment with Moore Jackknife Cantilever Masts.
LEE C. MOORE & COMPANY
INCORPORATED
PITTSBURGH • TULSA
EXPORT OFFICE • 30 ROCKEFELLER PLAZA, NEW YORK

SOMASTIC

Permanent Pipe Protection

IN PRACTICAL USE since 1930, SOMASTIC Pipe Coating has proved the *permanent* solution to the soil corrosion problem. SOMASTIC Pipe Coating effects two substantial economies:

. . . pipe protected with SOMASTIC Pipe Coating requires no excess of steel to offset corrosion losses; the steel wall need be only sufficiently thick to withstand operating pressures.

. . . permanent protection conserves pipe, ends costly take-ups for repairs or replacement of pipe damaged by corrosion.

PORTABLE PLANTS AVAILABLE EVERYWHERE

Available for pipe in sizes from one-half inch to 24 inches. Applied at central or railhead plants, or over-the-trench. New light-weight mobile unit permits economical handling of small reconditioning and coating jobs on short sections, without taking line out of operation.

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PIPE COATING

INDUSTRIAL ENGINEERING CO.

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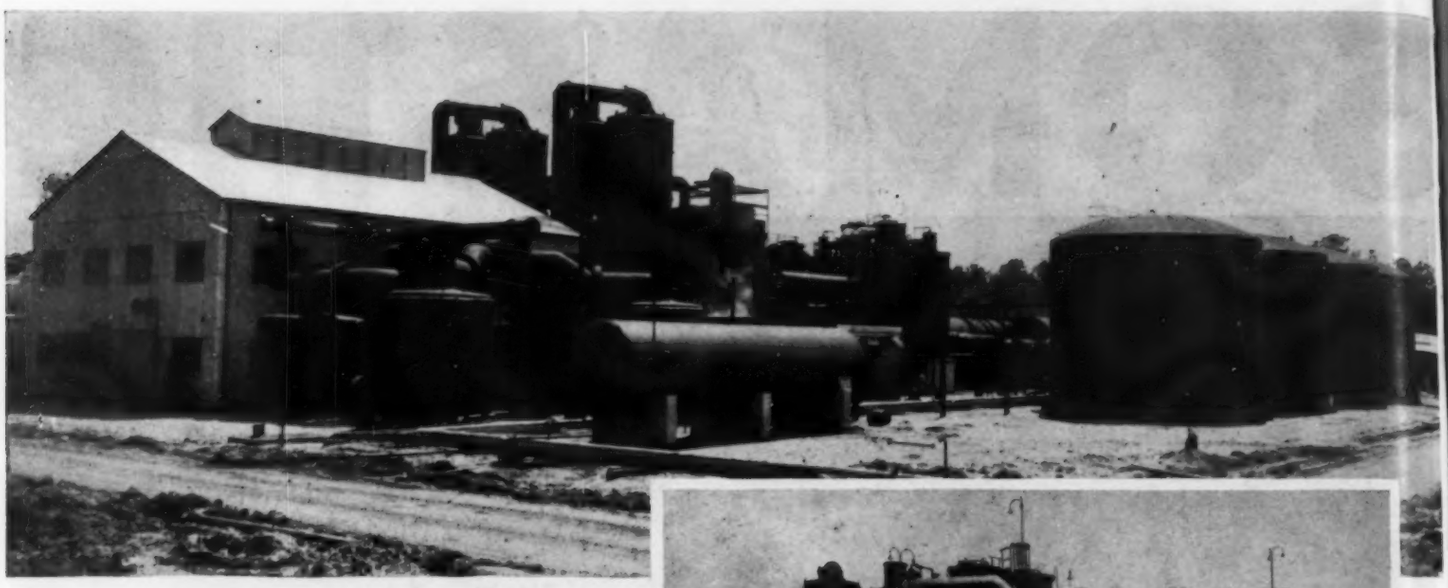


Two views of the CHEMICO Sulphuric Acid Regeneration Plant at a representative refinery.

In Many Refineries

ALL ACID REQUIREMENTS

are supplied by a CHEMICO PLANT

The CHEMICO Acid Regeneration Process has been selected for outstanding refineries all over the world because it has proven to be the most modern and economical method of reclaiming waste sulphuric acid and also for producing make-up acid.

The CHEMICO Regeneration Process operates at high temperature which completely consumes the hydro-carbons in the spent acid while decomposing the acid into its components of sulphur dioxide, oxygen and water; also producing additional sulphur dioxide from raw sulphur for make-up acid. The sulphur dioxide is then processed to fresh acid of 98% strength.

Addtional advantages of the CHEMICO Regeneration Process are its moderate investment, low operating cost, and absence of by-products and fume nuisance.

CHEMICO
CHEMICAL CONSTRUCTION CORP.

A unit of
American Cyanamid Company

CHEMICAL CONSTRUCTION CORPORATION
30 ROCKEFELLER PLAZA • NEW YORK 20, N. Y.
Cables, Chemiconst, New York • European Representatives, Cyanamid Products
Berkhamsted, Herts., England

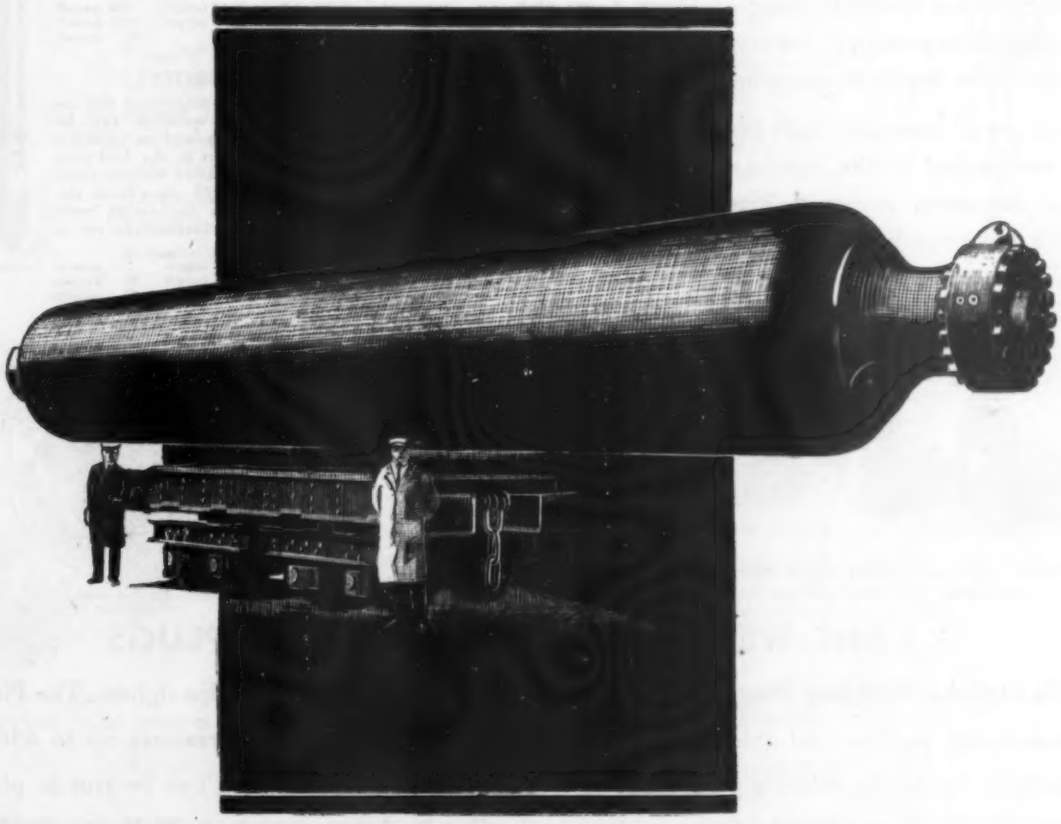
CHEMICO PLANTS are PROFITABLE INVESTMENTS

FIRTH BROWN

HOLLOW FORGINGS
for
OIL CRACKING PLANT

By a development of a special technique for the making of Hollow and Solid Forgings for all purposes, this Company has become recognised as the leading authority in this class of work.

The productions of the Firth-Brown forges include closed-end Hollow Forgings for the latest types of high-pressure boilers, special Hollow Forgings for oil cracking and hydrogenation plants and forgings for autoclaves and other highly stressed containers for chemical work, etc.



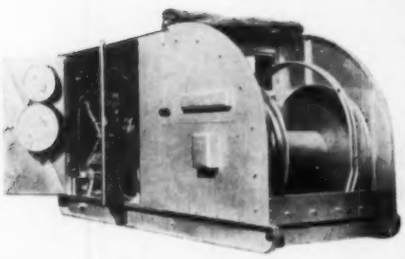
The illustration shows the Empire's largest Hollow Forging, measuring 50 ft. in length, 6 ft. internal diameter and weighing 70 tons, made by this Company.

THOS FIRTH & JOHN BROWN LTD SHEFFIELD

These LANE-WELLS Products mea

LANE-WELLS GUN PERFORATOR

For Fields Outside the UNITED STATES
Lane-Wells Portable Light Weight Hoist



The Light Weight Units are equipped with from 8,000 to 15,000 feet of special conductor-core cable, hoist, generators, auxiliary hoisting controls, visual-registering, depth-measuring and weight indicating devices. A five-point safety system of switches controls the firing of the gun and protects men and equipment during operations at the well. These Units can be used as all-purpose hoists for oil well services. The design and construction permits their use for Gun Perforating, setting Drillable Bridging Plugs, Gun Perforating, running Temperature Survey Instruments and checking bottom hole depth measurements.

Lane-Wells guns are of extremely high-pressure construction. Powder loads are packed to the correct density and placed directly behind the newly designed "Steelflo" ogival-point bullet to drive it from the barrel with greater force and less friction loss. Guns are supplied in sizes 3-1/16" O.D., 3⅝" O.D., 4-7/16" O.D. — 12-shot and 5¼" O.D. — 10-shot.

Lane-Wells "Steelflo" ogival-point bullets provide greater penetration, cleaner perforation and more drainage area.

LANE-WELLS SURVEY INSTRUMENTS

Run by the Operator

THE STANDARD PHOTO-RECORD MAGNETIC SINGLE-SHOT SURVEY INSTRUMENT

This instrument is run into a well on sand line, drill pipe, or tubing to give a permanent photographic record of the inclination and direction of uncased hole at any depth and at any time. Recording units are available for 5°, 10°, 24°, and 65°. The records it furnishes are simple and easy to read and are available for use within five minutes after the instrument comes out of the hole.

Instrument	2¼" O.D.	3' 0" Length	8 pounds
Outer Case	3¼" O.D.	6' 9" Length	63 pounds
Kit Box	8½" x 8½" x 3'		47 pounds

SMALL MAGNETIC SINGLE-SHOT

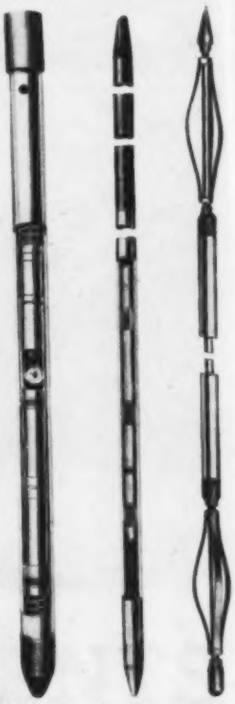
This apparatus consists of a light weight, small diameter survey instrument which is most widely used for the control of drilling wells. Due to its small size it can be run inside drill pipe. No knowledge of mathematics or photography is required for its operation and reading. Interchangeable inclination recording units for 4°, 10°, or 26° are available.

Instrument	1" O.D.	2' 4" Length	2¼ pounds
Outer Case	2¼" O.D.	8' 5" Length	38½ pounds
Kit Box	8½" x 8½" x 3'		47 pounds

GO-DEVIL INCLINOMETER

This apparatus is used for measuring the inclination only of drilling wells. It can be dropped into the drill pipe to land on a catcher inserted above the bit, or run in the drill pipe on a wire line when it is desired to take readings without pulling the drill pipe from the well. Three interchangeable inclination units are available for measuring inclinations up to 4°, 10°, or 26°.

Instrument	1" O.D.	2' 4" Length	2¼ pounds
Outer Case	1¾" O.D.	8' 3" Length	25 pounds
Kit Box	8½" x 8½" x 3'		40 pounds



Go-Devil | Standard Single Shot | Small Single Shot

Small Single Shot Disc

Standard Single Shot Disc

Go-Devil Disc

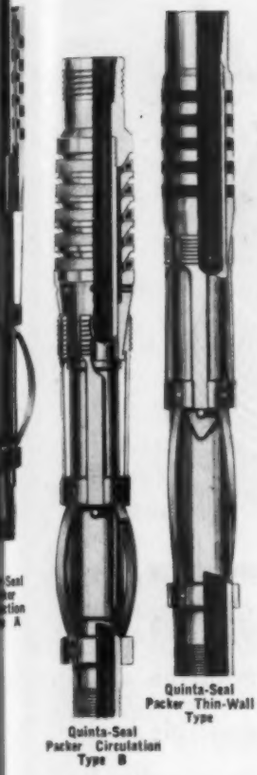
LANE-WELLS DRILLABLE BRIDGING PLUGS

The Lane-Wells Drillable Bridging Plug gives the operator an economical, positive and quick method of placing a drillable bridge in either a permanent or temporary installation. It provides the fastest and most economical method of plugging back and testing a well because the plug back and gun perforating is usually done with a single set-up of equipment.

This Bridging Plug will always stay exactly where it is set. Excessive pressures either from above or below only tend to set the slips tighter. The Plug has held successfully against pressures up to 6500 lbs. per square inch. The Plug can be run in place of the Gun Perforator on a Lane-Wells Gun Perforator unit or on conductor-core wire line. Complete surface control assures safety throughout the entire operation. This cast iron Plug is easily drillable at any time and can be supplied in a full range of sizes from 4¾" to 9⅝".

...ore oil and lower production costs!

LANE-WELLS PACKERS AND LINER HANGERS



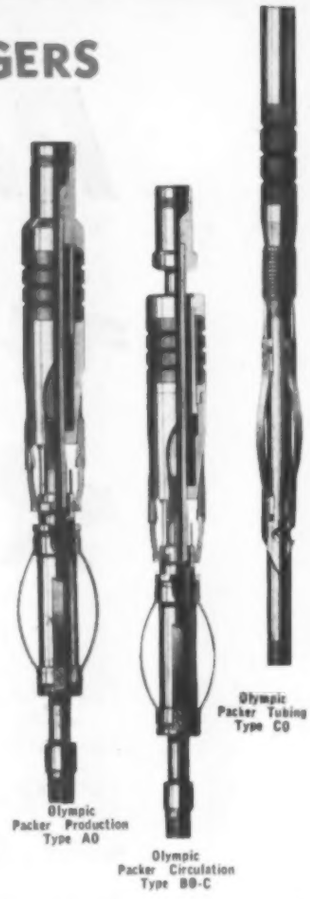
Each of the fifteen Types of Lane-Wells Quinta-Seal and Olympic Packers is correctly designed and built for successful operation under difficult conditions. Years of experience in fields throughout the world have proved that Lane-Wells Packers are built to "take it." Operators have found that you don't need to pamper them in service.

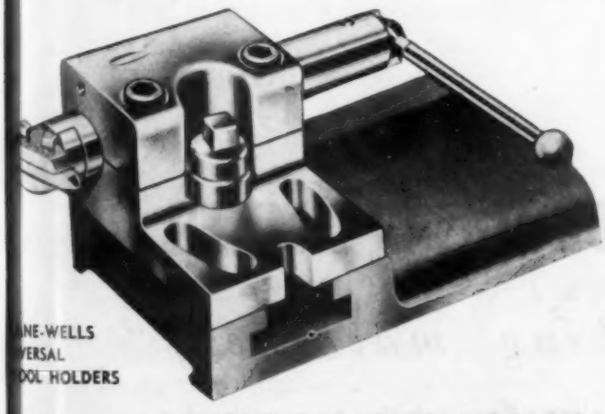
QUINTA-SEAL PACKERS

Lane-Wells Quinta-Seal Packers stand out for dependable performance under all well conditions. The multiple ring design makes them safe, easy to set, with ample bearing surface that gives a positive seal and resistance to high gas pressures. Heat-treated, alloy steel slips give a positive hold without cutting. The body of strong, seamless casing or tubing has the same internal diameter as the string on which the Packer is run. Circulation area is large enough to permit operation at normal speeds.

OLYMPIC TYPE PACKERS

Lane-Wells Olympic Packers are built for successful operation under extreme operating conditions. Four or more flatside rings are designed to meet formation testing specifications. They can be set and reset many times. Dove-tailed slips and free-wheeling cage assembly are operating features that permit this Packer to be used in deviated wells and formation testing work. Check these Packers carefully and compare them with your own specifications of packer requirements.





...vide High Speed Precision Production for all makes of Engine Lathes

LANE-WELLS Universal Tool Holder is a simple, rugged tool attachment that can be fitted to the carriage compound of any engine lathe. Standard tool bits used for boring, turning, threading, facing, forming, drilling, reaming or tapping are fastened into the heads. Each bit remains in place in the head.

Time for changing bits is reduced to that required to change the detachable heads. The ordinary engine lathe, equipped with the Universal Tool Holder and a supply of detachable heads, makes possible unlimited operations and approaches the production output of a turret lathe. In actual operation on production items, Lane-Wells Tool Holder has made possible a reduction of 35% in machining time.

Four sizes of tool holders fit practically all standard makes of engine lathes from 9" swing to 36" swing.

5 second tool changing for

BORING

FORMING

FACING

TURNING

Write for Bulletins on all LANE-WELLS Products

LANE-WELLS COMPANY

GENERAL OFFICE, PLANT AND EXPORT OFFICE

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PRINT IN BINDING

Press gang

From the sheet to a finished container involves as little as eleven operations. Each one, from the initial blanking, is carried out with speed and automatic precision by this gang of ten MOON machines. These complete plants have been installed by us in many parts of the world. As a team, they win both at home and away, and they embody every desirable feature which has arisen in a very highly specialised experience of drum making over many years. Can they be pressed into service for you?

MOON BROTHERS LIMITED

Specialists in drum making machinery

We make a very wide range of machines in addition, and we can offer a solution to every problem of metal container manufacture. If your post-war plans include this subject, don't hesitate to consult our experts who are ready and willing to help you to tackle your particular problem.

MOON Brothers Ltd., Beaufort Road, Birkenhead, Cheshire.

LIQUID GOLD

On August 27, 1859, the first drilled oil well in the world was brought in.

I am oil.
I am the rich, black blood of earth,
Surging through the soil for ages beyond measure.

I waited to be found.
I waited while the centuries slipped by
And Man still stumbled slowly overhead.

I was ready.
I held within me worlds of endless power
Undiscovered. Strength unknown...unwanted...
Till that historic day in Titusville,
Till that wondrous day in '59
When Man first opened earth
And worked to set me free.

Liquid Gold, they called me—
And as I gushed in roaring torrents upward,
Men fought and died to have me...
To channel me, enslave me to their ends.

But there were other men who saw in me
A greater promise...for all Mankind.
Men who glimpsed my power
And had the vision of the future in their dreams.

Yes, I have served Man well
These five and eighty years...
I have sent his motors racing over roads,
Churned his ships through seas,
Pushed his straining tractors across fields,
And lifted him above the earth
To soar unchallenged through the skies.

Today, my precious might is harnessed for
a greater cause.
Today the tanks of war, the trucks, the planes,
The very implements of Victory
Move forward on my strength.

Today, still greater reservoirs of power
Lie within me...waiting...ready.
And when the days of Peace return again,
I shall bring to Man
The rich, full promise of a better life...
I shall again unfold a vast new world to him.
I am oil...I am Liquid Gold!

Honoring the occasion of the 85th Anniversary of the drilling of the first oil well by Colonel Edwin L. Drake at Titusville, Pa., this tribute is published by Tide Water Associated Oil Company, one of the great pioneers of petroleum, and the first company to lay a pipe line from the oil fields of Pennsylvania to the coast.

Tide Water Associated • *World's Largest Refiner of Pennsylvania Oils*
New York • Tulsa • San Francisco

TIDE WATER ASSOCIATED OIL COMPANY

Inferno!

...AND PACIFIC TAKES IT

AFTER 10 YEARS OF ACTIVE SERVICE, this veteran Pacific Hot Oil Centrifugal Pump came home on a short furlough, for check-up and modernization.

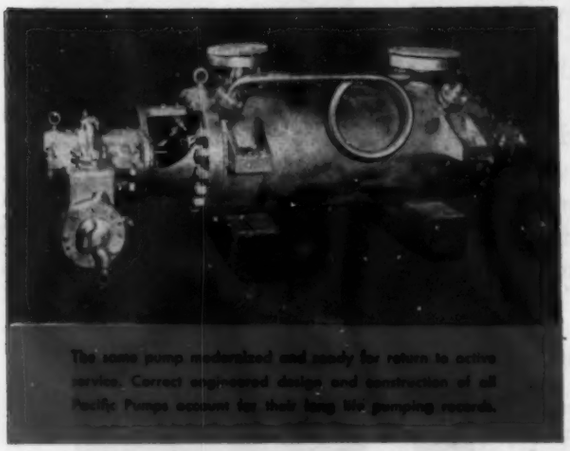
Another record pumping achievement for PACIFIC! When a precision pump, like this 4" 10-stage Pacific Hot Oil pump, takes the terrific punishment of 10 years continuous service under pressures of 1750 pounds and temperatures up to 850 degrees F.—*that's something to think about!* And realizing this pump operates with precision tolerances down to a third of a hair's breadth—*that's something to remember!*

To endure this kind of treatment for 10 long years, day in and day out, a pump must be tough. It must be made of the right stuff. Pacific Pumps are tough and they take it!

Serving in a large West Coast refinery, this veteran Pacific double-case pump (with forged steel outer case and chrome steel inner case and fittings,) poured out seething hot oil at the rate of 680 G.P.M. operating at 3450 R.P.M. Driven by a 900 H.P. steam turbine, it went into action June 1, 1933 and came out briefly in August 1940 for minor repairs. In November 1943, after a complete check-up, it was modernized with Pacific's newest patented Stationary Floating Seal and a few small miscellaneous parts were replaced due to general wear and tear. Then declared good as new, this "stout fella" was sent back to the firing line for another long period of pumping efficiency.

If you have pumping problems, contact PACIFIC! There's a size and type of Pacific Pump to meet all variables in pumping conditions—for oil field, refinery, process, utility and synthetic rubber plants.

MODERNIZED *and returned to duty*

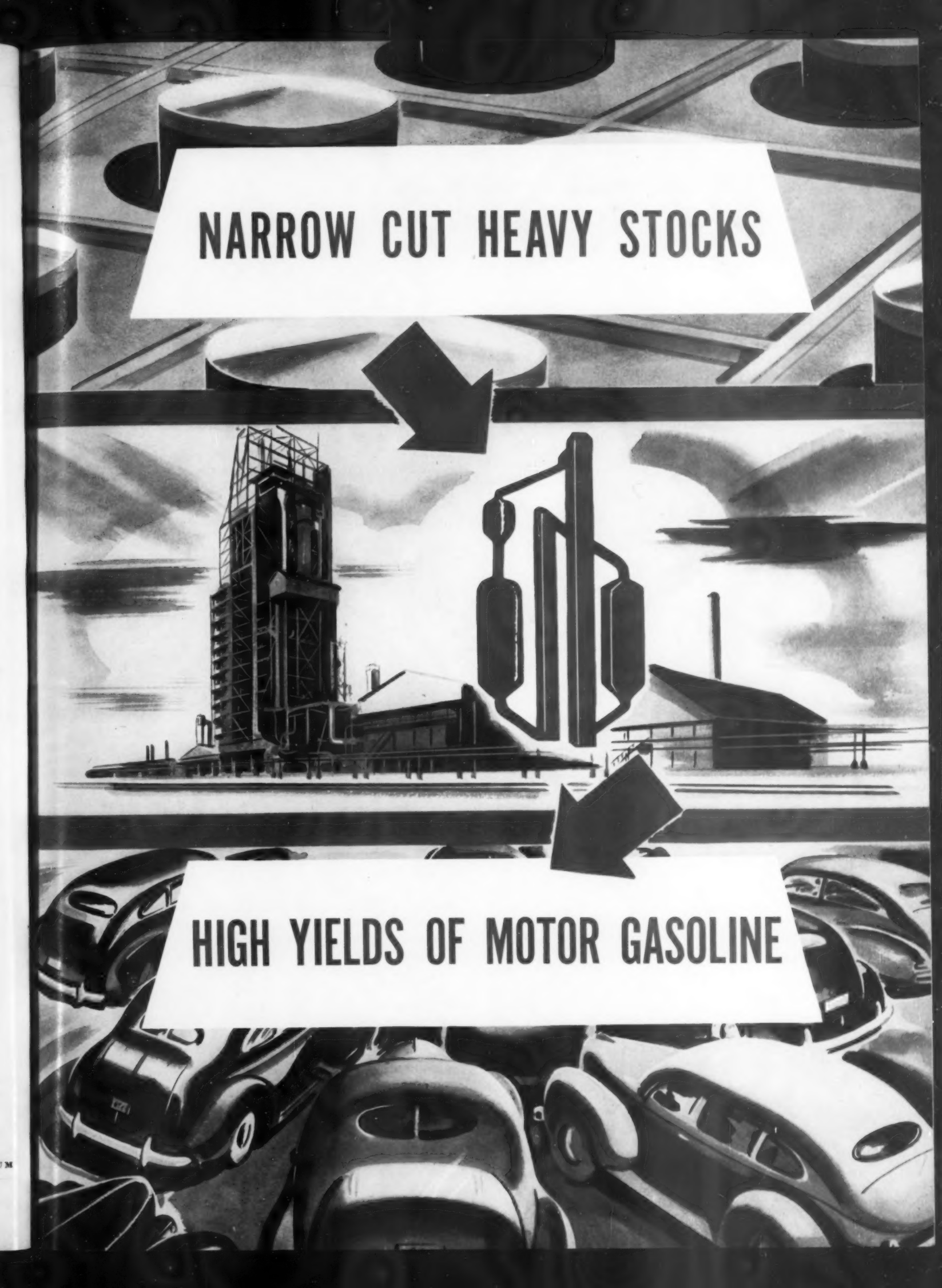


The same pump modernized and ready for return to active service. Correct engineered design and construction of all Pacific Pumps account for their long life pumping records.

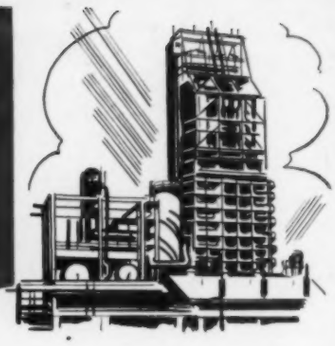
PACIFIC PUMP WORKS—Huntington Park, California
One of the Dresser Industries

MID CONTINENT PUMP SUPPLY CO.—Tulsa, Oklahoma
A Division of Pacific Pump Works

PACIFIC *Engineered* PUMPS


NARROW CUT HEAVY STOCKS
HIGH YIELDS OF MOTOR GASOLINE

TCC



THE PROCESS TO CONVERT NARROW BOILING RANGE HEAVY STOCKS TO HIGH YIELDS OF PREMIUM MOTOR GASOLINE

Narrow cut heavy gas oils, with mid-boiling points up to 775°F. — *undiluted with furnace oils or other valuable low-boiling materials* — processed once-through in Thermofor Catalytic Cracking* Units will yield:

- **— 48% to 53%, 10 lb. R.V.P. 400°F. end point high octane gasoline;**
- **— 20% to 30% high grade cycle stock suitable for use in No. 2 furnace oil.**
- **— propane-free liquid recoveries of 99% to 101% and 10 lb. motor gasoline plus cycle stock production of 86% to 92%.**

When desirable, coke still distillates and visbreaker distillates can also be effectively processed in T.C.C. units to high yields of high octane gasoline.

Thermofor Catalytic Cracking with T.C.C. Synthetic Bead Catalyst opens the way to higher quality premium motor gasoline at lower cost, particularly from narrow cut heavy gas oil stocks.

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PETROLEUM REFINING PLANTS

WORLD PETROLEUM

Founded by Russell Palmer

PUBLISHED BY MONA PALMER

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

VOLUME 15 | SEPTEMBER, 1944 | NUMBER 10

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EDITORIAL

MOVING TOWARD A WORLD OIL COMPACT

IN evaluating the petroleum agreement recently concluded between representatives of the United States and the United Kingdom it is necessary to bear in mind that the conference had a dual purpose. First, it was intended to bring about the adoption of a common policy in relation to oil development activities undertaken by citizens of either country in any part of the world. The substance of the understanding arrived at in relation to this subject is expressed in those clauses of Article I which state that all valid concessions and lawfully acquired rights shall be respected, that the principle of equal opportunity shall be observed in connection with the acquisition of concessions for exploration and development and that no effort shall be made unilaterally to interfere with the exercise of duly acquired rights.

American and British capital and enterprise have been chief factors in the discovery and exploitation of oil resources in many parts of the world. The United States and the British Commonwealth are the largest consumers of petroleum products and for that reason have a strong national interest in the maintenance of equal opportunities and of sound technical and economic conditions in the industry. Agreement between these two national entities on the fundamental principles which they are to follow is a primary essential to stabilization of the international oil industry.

At the same time the conference was made the vehicle for advancing the project for a world agreement concerning oil. In this aspect of its deliberations and conclusions it is easy to see the influence of ideas which the American Department of State and especially its distinguished head, have been instrumental in incorporating in international agreements adopted for other commodities.*

Following the precedents of these earlier agreements, the agreement just concluded is regarded as preliminary to the establishment of a permanent petroleum council composed of representatives of all countries interested in petroleum, including both the exporting and the importing nations. It is contemplated that the council will have the duty of determining the essential petroleum requirements of consuming countries and the means by which these are to be equitably supplied.

**See "Background For a World Oil Compact" in August 1944 issue of World Petroleum.*

If the council is to be more than an advisory board this may be taken as pointing to a system of proration insofar as export and import are concerned. All peaceable nations are to be assured of obtaining adequate supplies of petroleum on a non-discriminatory basis and at a fair price. Under these conditions a fair price may be taken to mean a ceiling price and, indeed ceiling prices set by international agreement, are no novelty. It is probable that the framers of the agreement purposely avoided making the language in reference to these points too specific inasmuch as the final determination of the scope and application of the convention to be adopted naturally falls within the province of the world group to be presently assembled.

As a preliminary to such action as the international conference may decide upon a commission of eight members representing the United States and Britain is established. Since this commission is directed to prepare "long-term estimates" of world demand and supply it is a reasonable assumption that it is expected to provide the basis of an operating plan for the projected international organization, if and when it is formed. Selection of the membership of this commission, therefore, is one of the important and critical steps in the evolution of the entire scheme. If it consists merely of government officials whose knowledge of oil industry operations is mainly theoretical the chances of arriving at a workable and widely acceptable plan of operation will be materially lessened. A logical procedure would be to have each half of the commission consist of two government officials and two members selected from the ranks of the oil industry who are particularly conversant with the industry's international operations. So constituted the commission should be able to produce a report that would command confidence in its accuracy and impartiality. Industry representation assumes added importance from the implied suggestion in the conference report that governments shall dictate to companies under their jurisdiction the manner in which their operations shall be conducted.

The document drawn up at the recent Washington meeting is one that contains little that is open to criticism but much that calls for clarification. Much will depend also upon the way in which the proposals are implemented in actual practice.

Chairmen Beaverbrook and Hull Confer Before Start of Conferences.

INTERNATIONAL PETROLEUM CONCLAVE TO FOLLOW BRITISH-AMERICAN AGREEMENT

Washington

FIRST long step in international cooperation for the development and use of the world's oil resources was taken by Great Britain and the United States when they signed the petroleum compact here August 8. The agreement lays down broad general principles which it is expected other oil producing and consuming countries will subscribe to. With the two countries that control a large part of the world's oil now having laid the groundwork, plans are under way for making the agreement multilateral by bringing in other important producers —Russia, Netherlands, Venezuela, Colombia and others. The understanding here is that a conference of their representatives will be held very shortly—as soon as it can be assembled.

The Anglo-American pact is described by the State Department as "of an interim character" and preliminary to the negotiation of a final agreement in which the governments of all producing and consuming countries interested in the international petroleum trade will be asked to participate. The agreement provides that the necessary steps, preparatory to calling a world petroleum conference for negotiating a multilateral compact, will be taken promptly.

Acting Secretary of State Stettinius, who signed the agreement on behalf of Secretary Hull, chairman of the United States Delegation, said: "This agreement on petroleum between the governments of the United States and the United Kingdom is a most constructive forward step toward long range collaboration between the two continents in the international economic field. It is intended that this agreement be followed in due course by a multilateral petroleum agreement among all interested countries. This agreement is an example of the kind of arrangement which it is hoped can be concluded from time to time in order that international economic collaboration may be assured".

The formal pact signed August 8 was the outgrowth of the discussions by the "Cabinet" level delegations of the two countries headed by Acting Secretary of State Stettinius and Lord Beaverbrook, Lord Privy Seal of Great Britain. It follows closely the exploratory discussions held in Washington April 18 to May 3 this year by technical groups representing the two countries.

The pact is to go into effect when the two governments have notified each other of their readiness to bring it into force. It can be terminated on three months notice by either government, or when is superseded by a multilateral agreement.

The two governments agreed that oil supplies "should be available in accordance with the principles of the Atlantic Charter and in order to serve the needs of collective security". Among the broad principles laid down is an assurance that adequate supplies of oil will be available to all "peaceable" countries at fair prices and on a non-discriminatory basis subject to such collective security arrangements as may be in force at the time. Both countries go on record for development of petroleum resources with a view to the sound economic advancement of producing countries. Recognition is given to the principle of equal opportunity in the acquisition of concessions. Respect is to be observed for "valid" concession contracts. The agreement further favors freeing the production and distribution of petroleum from unnecessary restrictions.

The agreement provides for setting up an International Petroleum Commission composed of four representatives from each of the two governments. This body will be charged with the responsibility of estimating world demand for petroleum and recommending to the two governments the manner in which this demand may best be satisfied in accordance with the general principles of the agreement.

The recommendations of this commission, if approved by the two governments, will be issued with a view to their adoption by the American and British companies operating in the international petroleum trade. Further, the commission is charged with the duty of investigating Anglo-American problems relating to efficient and orderly operation of the international petroleum industry.

Early appointment of the four men to serve as the American members of the international commission is expected. Presumably they will be named by the President on nominations by the State Department and indications are that the oil industry will be represented. The commission will be an official body and the members will be on the payroll of their respective governments. The staffs of the commission — advisers and specialists in all phases of oil industry operation — are likely to be on a joint pay roll from funds provided by both governments.

The United States delegation that participated in drawing up the agreement comprised Secretary of State Cordell Hull, chairman; Petroleum Administrator Harold Ickes, vice chairman; Secretary of the Navy Forrestal; Undersecretary of War Patterson; Foreign Economic Administrator Crowley; War Production Board vice chairman Wilson; Deputy Petroleum Administrator Davies and State Department Petroleum Advisor Rayner.

In addition, Harry C. Hawkins, director, Office of Economic Affairs, State Department, served as advisor to the American delegates. James C. Sappington, Assistant Chief, Petroleum Division State Department, acted as executive secretary and John A. Loftus, also of the Petroleum Division, was recording secretary.

The British delegation consisted of the Right Honorable Lord Beaverbrook, Lord Privy Seal, head of the delegation; The Right Honorable Richard Law, Minister of State; the Right

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Honorable Geoffrey Lloyd, Parliamentary Secretary to the Ministry of Fuel and Power, and Ralph Assheton, Financial Secretary to the Treasury. Sir William Brown served as chief technical advisor to the delegation, and Victor Butler, as secretary.

The text of the agreement, aside from its explanatory section, follows:

Introductory

The government of the United States of America and the government of the United Kingdom of Great Britain and Northern Ireland, whose nationals hold, to a substantial extent jointly, rights to explore and develop petroleum resources in other countries, recognize:

1. That the ample supplies of petroleum, available in international trade to meet increasing market demands, are essential for both the security and economic well-being of nations;

2. That for the forseeable future the petroleum resources of the world are adequate to assure the availability of such supplies;

3. That such supplies should be derived from the various producing areas of the world with due consideration of such factors as available reserves, sound engineering practices, relevant economic factors and the interests of producing and consuming countries with a view to the full satisfaction of expanding demand;

4. That such supplies should be available in accordance with the principles of the Atlantic Charter and in order to serve the needs of collective security;

5. That the general adoption of these principles can best be promoted by international agreement among all countries interested in the petroleum trade, whether as producers or consumers.

Article I

The two governments agree that the development of petroleum resources for international trade should be expanded in an orderly manner on a world-wide basis with due consideration of the factors set forth in Paragraph 3 of the introductory article and within the framework of applicable laws or concession contracts. To this end, and as a preliminary measure to the calling of the international conference referred to in Article II below, the two governments will so direct their efforts with respect to petroleum resources in which rights are held or may be acquired by the nationals of either country:

1. That, subject always to considerations of military security and to the provisions of such arrangements for the preservation of peace and prevention of aggression as may be in force, adequate supplies of petroleum shall be available in international trade to the nationals of all peaceable countries at fair prices and on a non-discriminatory basis;

2. That the development of petroleum resources and benefits received therefrom by the producing countries shall be such as to encourage the sound economic advancement of those countries;

3. That the development of these resources shall be conducted with a view to the availability of adequate supplies of petroleum to both countries as well as to all other peaceable countries, subject to the provisions of such collective-security arrangements as may be established;

4. That, with respect to the acquisition of exploration and development rights in areas not now under concession, the principle of equal opportunity shall be respected by both governments;

5. That the government of each country and the nationals thereof shall respect all valid concession contracts and lawfully acquired rights and shall make no effort unilaterally to interfere directly or indirectly with such contracts or rights;

6. That, subject always to the considerations mentioned in Paragraph 1 of this article, the exploration for the development of petroleum resources, the construction and operation of re-

Above: Left to Right Facing: Leo Crowley, Ralph Davies, Secretary Ickes, Secretary Hull, Charles Rayner, H. C. Hawkins, Secretary Forrestal, Under Secretary Patterson.

Below: Geoffrey Lloyd, Ralph Assheton, Ben Smith, Lord Beaverbrook, Richard Law, Sir Wm. Brown, Victor Butler.

Acting Secretary Stettinius and Lord Beaverbrook Sign the Agreement.

fineries and other facilities and the distribution of petroleum shall not be hampered by restrictions imposed by either government or its nationals, inconsistent with the purposes of this agreement.

Article II

The two governments recognize that the principles declared in Article 1 hereof are of general applicability and merit adherence on the part of all countries interested in the international petroleum trade of the world.

Therefore, with a view to the wider adoption and effectuation of the principles embodied in this agreement, they agree that as soon as practicable they will propose to the governments of other interested producing and consuming countries and international petroleum agreement which, inter alia, would establish a permanent international petroleum council composed of representatives of all signatory countries.

To this end the two governments hereby pledge themselves to formulate plans for an international conference to consider the negotiation of such a multilateral petroleum agreement. They also pledge themselves to consult with other interested governments with a view to taking whatever action is necessary to prepare for the proposed conference.

Article III

There are, however, numerous problems of joint immediate interest to the two governments with respect to petroleum resources in which rights are held or may be acquired by their nationals, which must be discussed and resolved on a cooperative interim basis if the general petroleum supply situation is not to deteriorate.

With this end in view the two governments hereby agree to establish an international petroleum commission to be composed of eight members, four members to be appointed immediately by each government. This commission, in furtherance of and in accordance with the principles stated in Article I hereof, shall consider problems of mutual interest to both governments and their nationals, and, with a view of the equitable disposition of such problems, shall be charged with the following duties and responsibilities:

1. To prepare long-term estimates of world demand for petroleum, having due regard for the interests of consuming countries and expanding consumption requirements;

2. To suggest the manner in which, over the long term, this estimated demand may best be satisfied by production equitably distributed among the various producing countries in accordance with the criteria enumerated in Paragraph 3 of the introductory article;

3. To recommend to both governments broad policies for adoption by operating companies with a view to effectuating programs suggested under the provisions of Paragraph 2 of this article;

4. To analyze such short-term problems of joint interest as may arise in connection with production, processing transportation and distribution of petroleum on a world-wide basis wherever the nationals of either country have a significant interest, and to recommend to both governments such action as may appear appropriate;

5. To make regular reports to the two governments concerning its activities;

6. To make, from time to time such additional reports and recommendations to the two governments as may be appropriate to carry out the purposes of this agreement.

The commission shall establish such organization as is necessary to carry out its functions under the agreement. The expenses of the commission shall be shared equally by the two governments.

Article IV

To effectuate this agreement the two governments hereby grant reciprocal assurances:

1. That they will adhere to the principles set forth in Article I, Paragraphs 1 to 6 inclusive;

2. That they will endeavor to obtain the collaboration of the governments of other producing countries in the implementation of the principles set forth in Article I, and will consult, as appropriate, with such governments in connection with activities undertaken under Articles III;

3. That upon approval of the recommendations of the commission they will endeavor in accordance with their respective constitutional procedures, to give effect to such approved recommendations;

4. That each government will undertake to keep itself adequately informed of the current and prospective activities of its nationals with respect to the development, processing, transportation and distribution of petroleum;

5. That each government will make available to the commission such information regarding the activities of its nationals as is necessary to the realization of the purposes of this agreement.

Article V

The two governments agree that in this agreement:

1. The words "country" or "territories"

(A) In relation to the government of the United Kingdom of Great Britain and Northern Ireland, include, in addition to the United Kingdom, all British colonies, overseas territories, protectorates, protected states and all mandated territories administered by that government; and

(B) In relation to the government of the United States of America, include, in addition to the United States, all territory under the jurisdiction of the United States;

2. The word "nationals" means

(A) In relation to the government of the United Kingdom of Great Britain and Northern Ireland, all British subjects and British protected persons belonging to the territories referred to in 1 (A) above and all companies incorporated under the laws of any of the above mentioned territories, and also companies incorporated elsewhere in which the controlling interest is held by any of such nationals;

(B) In relation to the government of the United States of America, all nationals of the United States, including companies incorporated under the laws of the territories referred to in 1 (B) above, and also companies incorporated elsewhere in which the controlling interest is held by any of such nations;

3. The word "petroleum" means crude petroleum and its derivatives.

Article VI

This agreement shall enter into force upon a date to be agreed upon after each government shall have notified the other of its readiness to bring the agreement into force and shall continue in force until three months after notice of termination has been given by either government or until it is superseded by the international petroleum agreement in Article II.

Secretary Ickes, Acting Secretary Stettinius and Lord Beaverbrook.

ANGLO-AMERICAN ACCORD ATTAINED

Problems of World Application Remain

By RUTH SHELDON

IMMEDIATE comment by the leaders of the oil industry upon the Anglo-American oil agreement has been remarkably restrained, ranging from the mild pronouncement that it is "constructive" to a cautious "I'll have to read it over again". The lack of either strong approbation or adverse criticism testifies to the extreme care which both governments are exercising in attempting to pave the way to a practical and equitable world oil accord.

The published agreement, however, has established more than a mere preliminary framework within which oil problems can be worked out. It has set forth principles which, if generally adopted, may modify international oil trade in several respects.

From the viewpoint of the American oil industry, a significant achievement is the clause that "with respect to the acquisition of exploration and development rights in areas not now under concession the principle of equal opportunity shall be respected by both governments". In the past American companies have not had much success in securing "equal opportunity" in British owned or controlled territory.

Recognition of this principle also may affect agreements between companies in relation to territorial development or marketing operations. For example, it apparently slashes straight across the much discussed "Red Line" agreement in the Middle East whereby the companies participating in joint operations are pledged not to expand their activities within a designated area.

Another clause in the agreement establishing the non-molestation of already acquired and legal concession rights, should calm fears expressed during the discussion early in the year over the project for a government owned pipeline across Arabia. Elimination of any distrust that may have existed on this score is a gain to both sides. Also it sets a precedent which if adopted by all countries at the proposed multilateral conference will prevent such economic and diplomatic difficulties as were precipitated by the Mexican and Bolivian expropriations.

Of major importance is the official recognition by both countries that oil must be produced in the future with prime consideration to the economic needs of the producing country. This in itself is a step forward in preserving world peace and preventing wars. Dissatisfied and economically depressed countries are the raw material of war lords. Equitable production, satisfying each country's basic economic needs, will give the world an important raw material for peace.

In addition, the oil industry will gain in security of operation by being relieved of the pressures of grasping or dissatisfied governments.

An intangible but important gain for both governments from the agreement is its recognition that their international interests and goals are alike. It assures the British for the first time that the United States is officially proclaiming its responsibility for the action of its nationals in world oil operations—a responsibility which heretofore has been very vague. This lack of responsibility has been one of the principal reasons for British uneasiness over American operations in areas under their control.

The negotiation of the agreement was remarkable for its lack of controversy and the ease with which fundamental principles were evolved with mutual approval. The preliminary form was worked out by the technical level group of American and British representatives in April. It was anticipated that there would be vigorous discussion on various points and undoubtedly certain changes when the high policy representatives met to formulate the final draft. With the exception of a few changes of wording, in the interest of clearer, more concise expression, there was only one change in the final draft from the preliminary one.

This change was the reduction of the time required for notice of termination of the agreement by either nation from six months to three months. This change was particularly significant. During the entire conference the only discussion which approached a controversy was the question of including in the agreement a clause which would recognize "imperial preference" among members of the British commonwealth. The British maintained that they should have the right to supply Empire needs first. Also they wanted the right to protect their sterling position by having the privilege of selling oil in dollar markets when necessary. They did not want to find themselves in the position of being compelled by an International Petroleum Council to conduct their oil business in a way which would be derogatory to their own economy.

The British finally agreed to the exclusion of the "imperial preference" clause in order that the principle of "equal access" promulgated in the Atlantic Charter might remain unimpaired. However, the British insisted on reducing the termination notice of the contract to three months. In effect, this reduction is expected to act as a check on the international organization that may later be set up by assuring that it will give full consideration to special problems such as the requirements of the British sterling position. For if measures were recommended which the British felt would be inimical they could file notice of termination and three months is no longer a period than it normally takes in the oil business to change shipping programs and shift market arrangements. Such a time limit check works both ways and it would have to be a serious problem indeed that would be permitted to overthrow an international oil accord.

The signing of the interim agreement is of course only the beginning of the task of reaching a sound international agreement with full powers of application. The majority of industry discussion and interest is centered upon the next steps to be taken.

First, there must be the appointment of the eight-man commission. It is generally understood in Washington that the four American representatives will be government men with subcommittees appointed to include representatives of the oil industry itself. However, the four-man commission probably will include men who actually represent both industry and government due to the fact that they are from the oil industry but working for the government during the war. One such man frequently mentioned is Ralph K. Davies, Deputy Petroleum Administrator and formerly of the Standard Oil Company of California, who was one of the American representatives during the agreement negotiations. Charles B. Rayner, Petroleum Adviser to the Department of State, likewise a negotiator, is considered a logical appointee.

The second problem which has been posed is whether or not the agreement will be ratified by the Senate, submitted to the entire Congress for approval, or remain an executive agreement. The State Department has been non-committal but the general feeling in Washington is that while the government may treat the British-American document as an executive agreement, it will seek Congressional approval for the subsequent international convention so that it will become accepted foreign oil policy. Congressional approval will put much more strength behind it than it could have as merely an executive agreement.

Discussion has also centered around the method by which the commission will deal with the injunction placed upon it to suggest the "manner in which estimated world demand may best be satisfied by production equitably distributed among the various producing countries" in accordance with "due consideration of such factors

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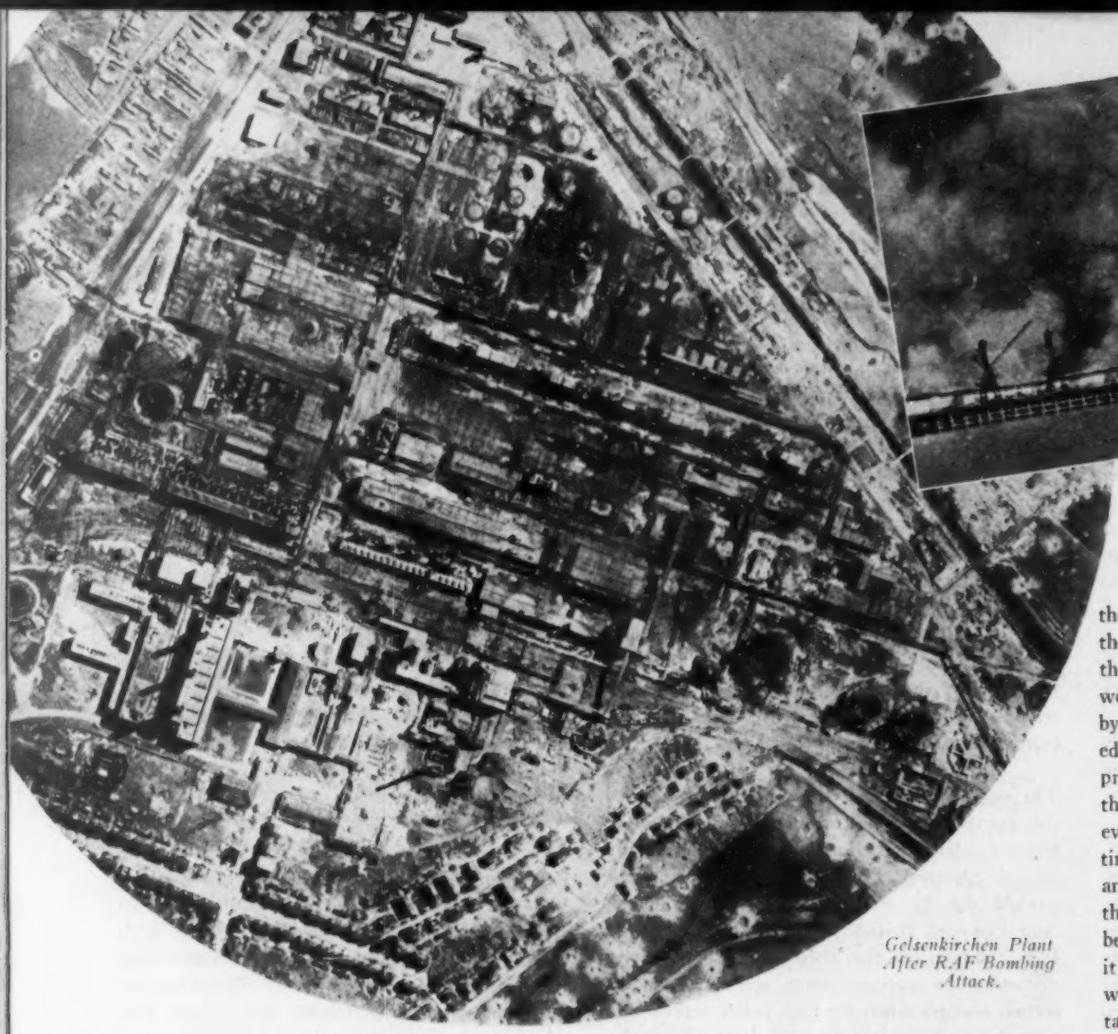
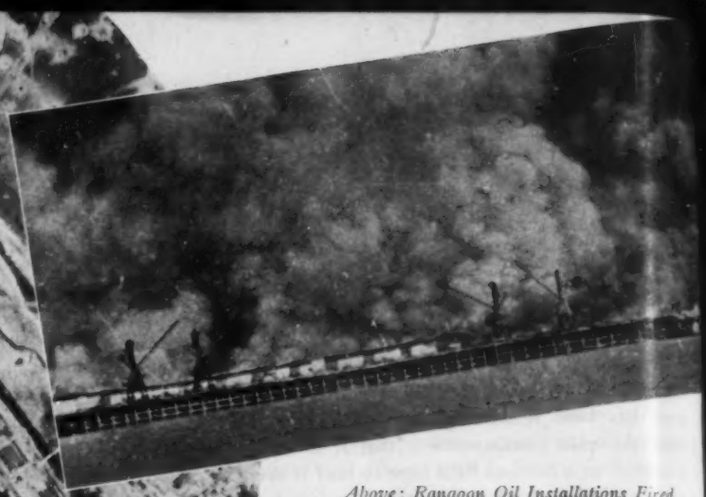


Gelsenkirchen Plant After RAF Bombing Attack.



Above: Rangoon Oil Installations Fired Before Japanese Occupation.

WORLD WIDE EXPANSION IS PROSPECT BEFORE INTERNATIONAL OIL INDUSTRY

Heavy Export Demand for Equipment Assured by Vast Reconstruction Tasks and Enlarged Development Activity Around the Globe

WHILE the oil industry in all petroleum producing countries of the United Nations is still concentrating its energies on turning out the tremendous volume of products required for military use recent developments pointing to the possibility of an early ending of the struggle have directed attention to the conditions that will surround it in the new phase of development that will open when peace returns. It is recognized that with the collapse of Germany, which is now regarded as inevitable within a period to be measured in months rather than years, there will come a lessening of the demand for military machines and for the fuel to power them even though the drive against Japan is stepped up to a greater intensity as assuredly it will be. This will enable oil companies to give renewed attention to the needs of the civilian population and of customers in neutral nations who have been forced to subsist upon short rations for the past three years or more. It will permit the makers of oil industry equipment to accept the urgent orders of private customers to which they have been compelled to turn a deaf ear while they were occupied exclusively in responding to the demands of military authorities. As a consequence of reduced pressure on the machinery of production there will be an easing of restrictions upon the employment of essential materials for other than direct war use.

Great industries—steel mills and other metal working establishments, giant motor vehicle plants and thousands of others making industrial equipment—which have concentrated their facilities entirely upon army, navy and air force needs will readjust their operations and reequip themselves to serve normal peacetime requirements. Alloy metals will again become available. Men released from military service or from war plant employment will return to their former occupations. Ships will run again on trade routes from which they were drawn to transport men and supplies to battle areas. Reconversion problems will arise but once the go-ahead signal has been given the industrial machine will move back into the channels for which it was originally designed with surprising speed.

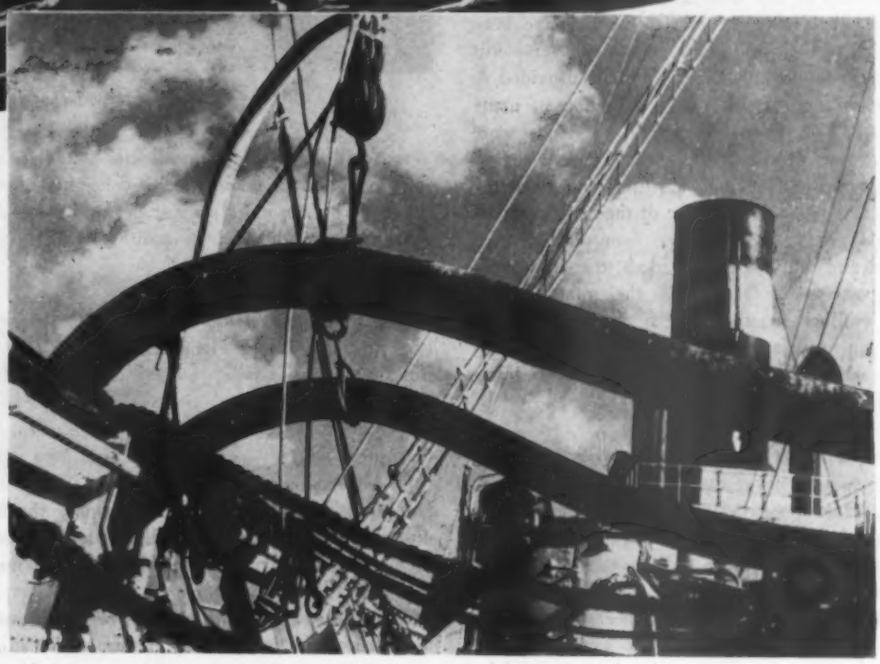
Statisticians and economists who have studied the probable course of events at the conclusion of the war anticipate a temporary situation in which the supply of petroleum products may exceed the consuming capacity of a war exhausted world. The demands made upon the industry by the war have grown to such wholly unexpected proportions and have led to such an upturn in production, particularly in the United States, that the sudden cessation of this demand, or even of a large part of it, will result for the time being, in the opinion of these experts, in an excess of supply above requirements. While the purchases of individual consumers who have been rigorously rationed will rise substantially it is pointed out that demand from this quarter will be limited by the sharp reduction that has taken place in the number of motor vehicles in use and by the time that will be required by the automotive industry to reconvert to peacetime operation. In countries that have been ravaged by the war even more time will be required to clear away the wreckage and to restore the facilities of distribution and the capacity for consumption. They agree however that this will be a temporary condition and that once the transitional period has passed the demand for petroleum products will surge upward to new highs and will be particularly strong in areas where the preceding deprivation has been most serious.

No such hiatus will occur in the activity of the oil equipment industry. Even now, before the restrictions imposed by the war have been removed, buying pressure from export markets in every part of the world is making itself felt. Whatever difficulties may confront other lines of business in regaining the foreign trade which they have been forced to neglect the oil equipment industry can look to the future with assurance. In fact the industry faces two tremendous tasks, either one of which is exacting enough to keep it busy for a long time to come. One of these is repair for the vast destruction caused by the war. The other consists in satisfying the accumulated demands of nearly five years during which the development of oil resources has been virtually suspended in practically all quarters of the globe.

In no other war since the world began has the destruction of property and of the means of

Right: First Bombing of Ploesti by U. S. Liberators.

production been carried out on a scale approaching even in slight degree the conflict that is now raging. In the westward sweep of Mongol and Tartar hordes over Asia and eastern Europe, in the invasions of the Roman Empire by Huns and Vandals, the looting and burning of a few rich cities satisfied the attackers. Even in World War I the flow and ebb of battle covered a relatively small area in Belgium and northeastern France. Today, when vast fleets of planes carry devastating bombs hundreds of miles beyond the fighting lines and when war has become a struggle between embattled powers of production even more than between opposing armies, manufacturing plants, transportation lines, port facilities and storage installations have become military objectives. Because liquid fuel is a vital factor in mechanized warfare oil fields, tank farms and refineries have first preference as targets. In Allied air assaults upon Axis powers and Axis-controlled areas thousands of planes have flown hundreds of thousands of miles to bomb oil installations of every kind from huge refineries and synthetic plants to trains of tank cars and strings of barges transporting petroleum products to the fronts. The effect of these attacks can be measured in the faltering of Nazi air resistance and in the weakening of its mobile ground forces. According to a statement issued some two months ago by high officers of the Allied air command 70 percent of the Nazi oil supply had been cut off at that time and more recently it has been asserted that over 50 percent of the productive facilities within the Reich itself have been destroyed. Since then the Allied drive against oil objectives has been intensified with the avowed purpose of eliminating remaining sources of supply as completely as may be possible. While the precise extent of the damage that has been inflicted on oil properties in Europe cannot be determined at the present time evidence accumulated by military authorities and by private observers indicates that every important installation in Germany has been bombed —in most cases by repeated attacks—with results ranging from the disruption of important units to virtually complete demolition. Refineries and large storage plants in Nazi occupied countries have been subjected to the same treatment. While the industrial future of Germany may depend upon the terms imposed at the end of the war the restoration of refineries and other petroleum facilities throughout the rest of Europe will be one of the most urgent tasks presented because of the immediate need for petroleum products and this will call for the expenditure of hundreds of millions of dollars in reconstruction and installation of new equipment merely to replace what has been wiped out.



Transferring Oil to Tanker at Haifa.

On the other side of the world the destruction caused by Japanese invasion and approaching expulsion will be no less widespread. In Burma, Borneo and throughout the Dutch East Indies wells, pipe lines, storage tanks and refineries were dynamited or put to the torch in the face of impending invasion. Everything that escaped destruction then or that the enemy has since suceeded in bringing back into operation undoubtedly will be thoroughly demolished by the Nipponese themselves before their withdrawal. Fields will have to be redrilled, pipe lines relaid and refineries, some of them among the largest in the world, built anew. Reestablishment of the oil industry in the Far East is one phase of post war planning which already has been made the subject of comprehensive preparation. Indeed, the importance of having oil available for use in the later stages of the push against Japan without the necessity of transporting all of it over distances of ten to twelve thousand miles is such that the work of rehabilitation is classed as a war undertaking rather than one that can await the conclusion of peace. When Allied troops land upon Java or Sumatra or other oil producing areas in the Western Pacific they will be accompanied by men trained in the techniques of drilling, pipe line building and refinery operation together with the special equipment needed to bring the wrecked oil industry back into partial operation. As soon as the military hold upon these regions has been made secure this advance guard of oil workers will be followed by employees of the oil companies owning the properties and by the representatives of engineering and construction firms armed with blueprints that already have been drawn for the resurrection of the oil industry in the Far East. A thousand million dollars is the lowest estimate of the cost of this job. It will take time to complete for it will require vast quantities of materials and equipment and it will occupy the energies and facilities of many manufacturers to supply these.

If no other task lay before the makers of oil industry equipment than replacement of the facilities wrecked by war it would provide the greatest construction program ever undertaken by the industry—more than twice the size of the current war program of the United States insofar as it relates to petroleum. But in addition to this it must extend its services to meet the requirements of a great expansion in oil development in all quarters of the globe.

From the commencement of the present world conflagration the development of oil industry operations has been brought to a standstill or reduced to a fraction of its normal volume in most parts of the world. Exploration has been halted; men engaged in field work have been recalled to their homeland for military service or because supplies no longer could be provided to maintain their operations. Production in many fields had to be cut back and refineries were forced to suspend operation because the means of transport were lacking. Drilling and construction came to an end because of the ban on export of machinery and supplies from the United States and the United Kingdom, the only countries possessed of facilities for their manufacture. The unfilled requirements of these years have built up an accumulated demand that will keep the workshops of equipment manufacturers humming for a prolonged period.

Moreover, war has made the whole world oil conscious as it never has been heretofore. Great transport planes, trucks, tractors, and jeeps have become familiar objects in the African interior, in the Near East, India and China, and in other countries that have learned for the first time of the wonders of industrial performance and swift communication that they make possible. They have performed a sales job that might have taken decades in the ordinary course of events and that will result in a growing demand for gasoline and fuel oil in areas where a few cans of kerosene formerly constituted the entire petroleum trade.

Another effect of the war has been to awaken governments everywhere to the economic value of the oil industry as a source of revenue and a means of stimulating industrial development. As a consequence the ruling powers of nations, principalities and dependencies that have been indifferent to the development of their mineral resources are keen to learn whether they possess this magic key to affluence and advancement and are eager to issue concessions and to encourage exploration. In countries where the existence of oil in small or large deposits is already known the desire to expand production is no less keen. A certain development following the war is a great increase in road building, a vast expansion of air routes, a multiplication of motor driven river and coastwise craft—all contributing to raise the consumption of petroleum products to levels far higher than ever before attained and to bring about an unprecedented degree of

Romanian Refineries Set on Fire by U. S. Bombers.

activity in the search for oil and in enlarging its production to match the new heights of demand. The age of oil is just beginning for the world as a whole and its zenith is far beyond the kin of any now living.

Much time must elapse before all this progress can be realized. The long term outlook is significant because it points to a sustained and ever expanding field of usefulness and a corresponding enlargement in the demand for the methods, machinery and service needed to keep pace with this development. For the immediate future however the manufacturers who supply the industry with its tools will be fully occupied in supplying the requirements arising from the war.

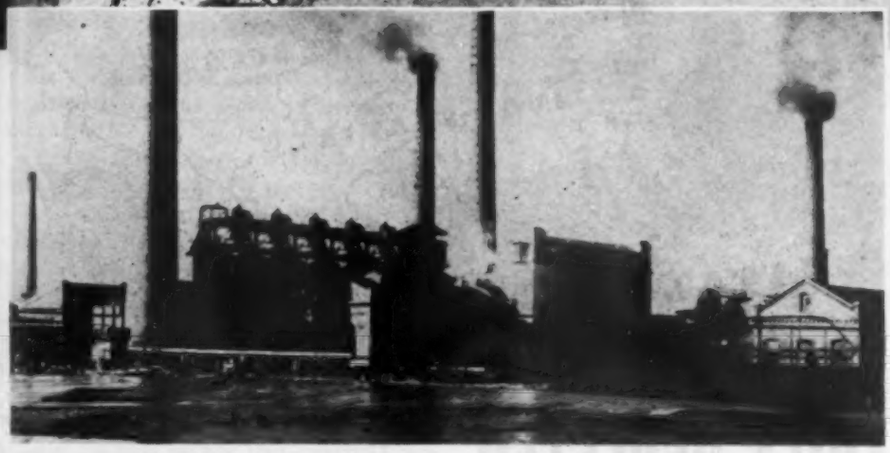
In the United States the fear has been expressed that the drain imposed upon the nation's oil resources in providing the greater part of the oil required for the military operations of the United Nations will lead to the early exhaustion of reserves and relegate the country to a minor position in the world's oil industry. The study that has been devoted to the situation, the assurances given by prominent geologists and the very fact that it has been possible to raise production by approximately a million barrels daily under the spur of war necessity has led to a more encouraging appraisal of the situation. It is the considered judgment of the most competent technical authorities that production in the United States during the current year will attain the highest rate of which the industry in its present stage of development is capable without risk of injury to the potentialities of its fields. Once the peak of military requirements has been passed many fields will be reduced to a lower daily output but this will be of no serious disadvantage to the industry as a whole since it will coincide with a period of lessened demand. Increased drilling and an intensified search for new fields will naturally follow the removal of rigid governmental controls in order to prepare for the rise in consumption that will follow as soon as the readjustment to peacetime conditions takes place and the automotive industry returns to its normal business of turning out machines for civilian use.

In the refining branch of the industry there will be the need of extending catalytic cracking processes and other advanced methods of operation to plants to which they have not been introduced during the war and of adjusting refining practice and equipment to changes that will have taken place in market demand. New products will come into existence and will provide new outlets and still wider diversification. The industry will operate under conditions somewhat different from those that have governed it during the past three years but there is no reason to anticipate any serious interruption in its growth or any long continued diminution in demand for its products or for the machinery and equipment essential to its expansion.

Prior to the war the United States possessed nearly four-fifths of the productive oil wells in the world. It accounted for 65 percent of the total oil output and provided 13 percent of the exports. While there is no reason for a decline in the actual size and importance of the industry in this country, it is not to be expected that it will maintain the same relative preponderance in the future world situation that it has held in the past.

With the industrial development heretofore centered largely in Western Europe and North America extending to other continents, with a network of surface roads and air routes providing improved means of transportation and communication, with the more general use of agricultural and other machinery and a higher standard of living, the consumption of petroleum products will increase in all these areas and will give added impetus to the development of indigenous or nearby oil resources. Considering the fact that consumption per capita in some of these countries, even among those that are substantial oil

Leghorn Oil Plant After Allied Bombing Attack.



Refinery at Drohobycz Bombed by Air Force, Later Captured by Russians.

producers, is as low as two gallons yearly the room for increase appears almost limitless though the growth necessarily must be gradual. With material progress widely diffused, however, the aggregate rise in demand will be very great and will absorb a higher percentage of the enlarging world supply.

American and British capital has been a principal factor in the past in the development of oil production in other parts of the world. It is logical to expect that it will continue to perform that function though with a larger degree of participation by national interests within the countries where such development takes place. The technical knowledge of oil discovery, production and processing developed to a high degree in these countries and the specialized equipment which is the outgrowth of their experience and long study of oil industry requirements will continue in demand for its upbuilding in other parts of the world.

The trend of the future is discernible in the increasing attention that international oil companies are giving to the exploration of new regions and the more intensive development of areas that heretofore have been minor factors in production. It is evidenced by the fact that other companies which in the past have confined their operations to domestic fields are now reaching out to establish themselves in outside countries. A number of strongly established companies that previously limited their activities to the United States are now taking up holdings in South America and other exterior regions in recognition of the increased importance which these fields are coming to occupy.

In summation it may be said that the demand for petroleum products, after a probable temporary drop at the close of the war, will resume its pre-war growth as soon as the transition to normal conditions is completed and will steadily rise to levels higher than ever before attained.

Restoration of the fields, refineries and other installations wholly or partially destroyed in the course of the war constitutes an immediate construction task of tremendous proportions requiring the disbursement of thousands of millions of dollars for materials, labor and equipment.

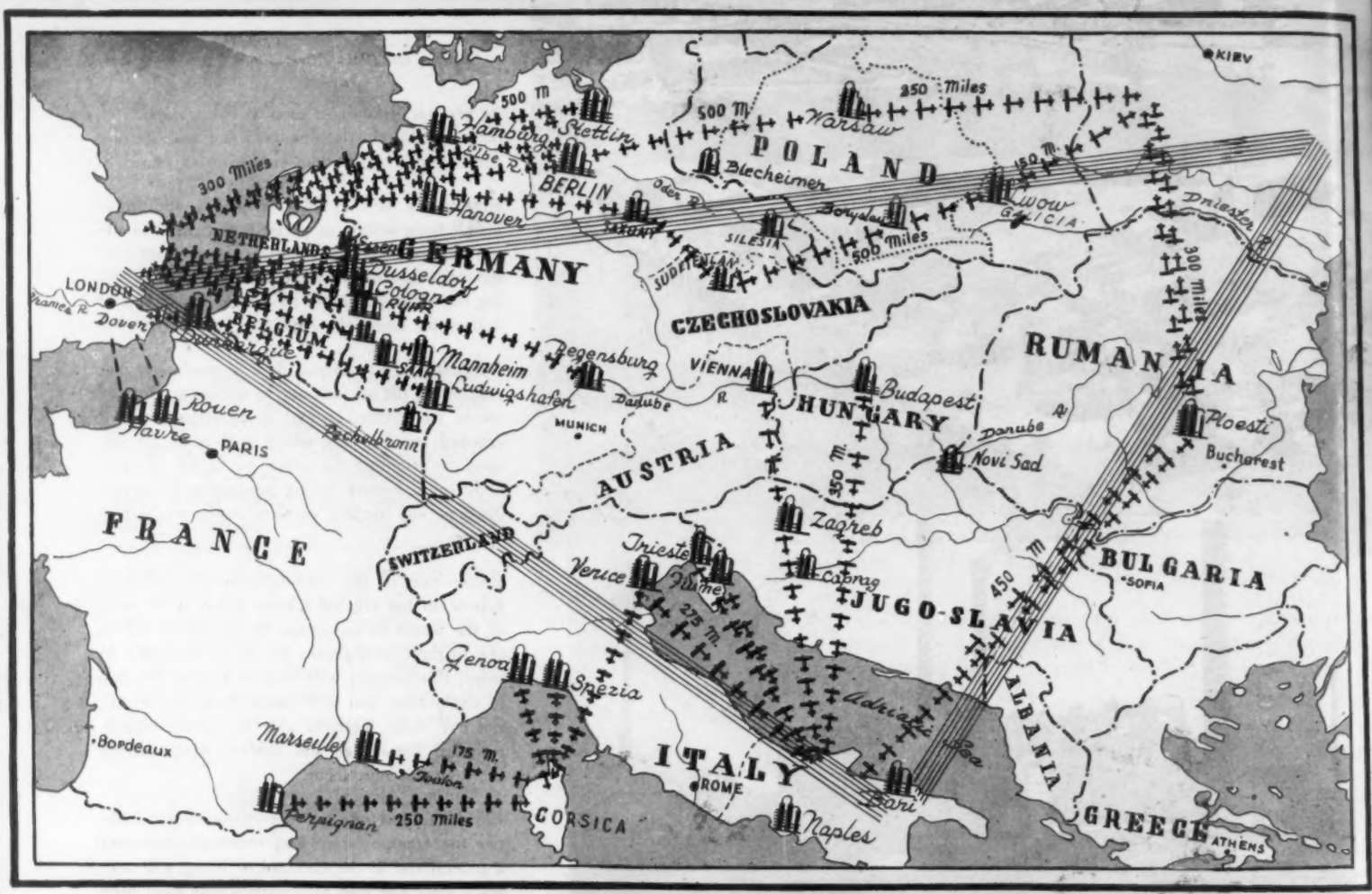
Damming up the normal flow of machinery and supplies to the oil industry in many parts of the world has created a vast accumulation of unsatisfied requirements which will press for immediate attention in order to fulfill contract obligations, restore falling production in certain districts and replace obsolete equipment everywhere.

Recognition of the national economic value of petroleum has created a keen desire in all parts of the world to encourage the search for oil or the further development of resources known to exist; this attitude will lead to a great increase in exploration and will create broad opportunities for those interests able to supply capital, technical knowledge and modern equipment to carry on this movement.

Industrial development, the extension of facilities for transportation and communication and a general rise in the standard of living will take place after the war in countries that have been backward in these respects; this will result in a larger consumption of petroleum in these areas and further stimulate the development of such oil resources as they may possess.

For countries that have facilities for manufacturing the supplies and equipment required by the oil industry—of which the United States and the United Kingdom will be about the only ones remaining after the close of the war—the export market will assume a new importance in view of its greatly expanded requirements and will be deserving of closer attention and more concentrated sales effort than ever before.

Maikop Installations Destroyed by Retreating Russians.



NAZI OIL SUPPLY STEADILY DEPLETED
By Concentrated Allied Attack

FROM time to time during the course of the war WORLD PETROLEUM has published maps and information showing the gradual constriction of Axis oil supplies before the encircling movement of Allied attack and the mounting vigor of aerial assault upon Nazi dominated oil installations. Within the past two months this encirclement has become complete and the destruction of the source facilities of liquid fuel supply on which depends enemy power of continued resistance may be said to have entered its final and decisive stage.

Establishment of the triangular shuttle route over which bombers can fly from Britain to western Russia, thence to bases in southern Italy and from there back to the original starting point has brought every part of Hitler's Fortress Europe within range of Allied attack. It has given greater mobility to aerial tactics. If weather conditions interfere with operations from one base, planes from other bases can continue their attack along other sections of the triangle, making possible a practicaly continuous assault. More importantly it has brought within relatively easy range of United Nations bombers, synthetic plants and storage facilities that had been set up in Eastern Germany, in Silesia and Slovakia, which were difficult to reach from British bases.

With the closing in of the Allied ring a concentration of aerial attack on oil installations such as various civilian critics had been impatiently urging has taken place. Systematic bombing of refineries in Northern Italy, at Trieste and Fiume, in Yugoslavia, Austria and Hungary, as well as of Romania's oil center, has been carried on. Refineries and synthetic plants in eastern Poland and Slovakia have been blasted and renewed large scale attacks have been directed against the great Leuna works, Regensburg, Gelsenkirchen, the entire industrial region along the Rhine and in Hanover and Hamburg areas.

Not only manufacturing plants but storage terminals, loading and transfer points, tank cars, barges and motor trucks carrying petroleum products to the fronts have been the object of attack. Oil dumps behind the lines have been set on fire, mines have been laid along the Danube and in coastal waters and a systematic campaign has been waged to disrupt transport and to prevent supplies from reaching points where they can be used against the invading forces. This systematic bombing of Nazified oil installations and transport facilities is reflected in the steady weakening of the Luftwaffe which deprives Hitler's armies of overhead protection and enables Allied flyers to range almost at will over Germany itself and the occupied areas. It greatly hampers the maneuvering of German armor and the flow of fuel to the battle areas.

While Allied air forces are demolishing manufacturing plants and disrupting the means of transportation and as one observer has aptly expressed it "are beating out the pattern of victory across the continent of Europe" the advance of Russian ground forces in the east is cutting into Nazi areas of production. The recent capture of Drohobycz and occupation of the Borislaw fields has sliced off 80 percent of Galician production. With Romania out of the war and Hungary likely to follow Hitler will have only the Reich and former Austria which together can provide no more than 2,000,000 tons or little more than a tenth of the minimum requirements for the maintenance of the army and air force at full strength, assuming that the operation of these facilities has not been seriously interferred with. Synthetic plants likewise are being steadily put out of commission. Based on careful reconnaissance of bombed installations the Air Force Command reports that less than half of Germany's synthetic capacity is in operation.

According to this estimate synthetic production at the utmost cannot yield more than another 2,000,000 tons. From available reports it appears that fully two thirds of the Nazi oil supply of 1940 has been eliminated. As the noose draws tighter and the tempo of air attack rises to full crescendo this remnant will still further diminish.

B. Dykstra and J. A. Wirtensohn of Shell Crossing Sardinata River on Visit to San Martin Test.

Transferring Oil Equipment at Pto. Reyes on Sardinata River.

COLOMBIA ENTERING NEW ERA
of Wide Spread Exploration

By E. Ospina-Raeines, *Petroleum Economist*

THE past twelve month period has witnessed unusual and extensive exploratory activity on the part of the six majors operating in Colombia. The principal drawback, which is expected to be alleviated in the near future, has been the lack of sufficient and adequate oilfield equipment. The many fishing jobs which have occurred during the past year may be attributed almost exclusively to the lack of proper equipment and the necessity of resorting to substitute and makeshift material in carrying out the wildcat program. Colombia is on the threshold of a very intense and widespread wildcatting program, and the past twelve month period may be interpreted as a preparatory period, particularly in view of the tremendous acreage earmarked for surface exploration and test drilling.

Surface and geophysical exploration in Colombia has been carried out extensively and in all the prospective oil provinces of the country. Current geophysical exploration is being undertaken by the six majors as revealed in Table 1.

TABLE I
CURRENT GEOPHYSICAL EXPLORATION IN COLOMBIA

Major Operator	Geophysical Service	Crews Operating	Location: Oil Province	Location: Department (See Index Map)
1. Tropical	S. S. C. D.	1 Seis	Llanos	Meta-Boyaca
2. Shell	United	1 Seis	Llanos	Meta
	Shell	1 G. M.	Caribbean	Bolivar
3. Texas	Texas	1 Seis	Llanos	Caqueta
	Petty	1 Seis	Caribbean	Magdalena
	I. X. C.	1 Seis	Caribbean	Bolivar
	Texas	1 Magnet	Caribbean	Bolivar
4. Socony	R. Ray	1 G. M.	Caribbean	Magdalena
		1 G. M.	Llanos	Arauca
	I. X. C.	1 Seis	Caribbean	Atlantico
5. Richmond	G. S. I.	1 Seis	Caribbean	Magdalena
		1 Seis	Caribbean	Bolivar
6. Gulf	Due to contract	1 Seis	Mid-Magd.	Antioquia

As may be observed from the data of Table I, currently there are eight seis, one magnetometer and three G. M. crews operating in the country. Recently a Tropical G. M. crew completed a survey along the southern part of the Pacific coast, from the Ecuadorean border to the Patia River region, an area which has been actively explored and has been the object of a number of oil concession applications well distributed among the majors. Further work northwardly is scheduled by the same crew. Seismograph Service Corporation has plans underway for organizing several geocrews. This firm recently established its office headquarters in Bogota with Robert F. Aldgedge as general manager of Colombian operations.

The result of the widespread exploratory activity has been the filing of a great number of oil concession applications by the six majors in all the prospective oil provinces of the country. Official data reveal that since March 1931, when the oil law came into force, to date 256 applications for oil concessions have been filed with the government, whose area totals close to 12,000,000 hectares (30 million acres). With an estimated 20 million hectares (50 million acres) of prospective oil land in the country, the concession applications filed to date cover 60 percent of this area. It is very significant that of the 256 applications, 105 were filed with the Ministry during the twelve months just ended.

These concession applications range from 200,000 hectares (494,000 acres) in the Llanos to 50,000 hectares (123,500 acres) elsewhere in the country. Once the concession has been granted under contract, the operator, according to the provisions and interpretation of the oil law, is obliged to install a rig and spud a test before he can surrender the tract. In a bill which will be submitted by the Minister of Petroleum to Congress this exacting provision of the oil law is amended and provides that oil concessions may be surrendered on the basis of the technical findings if such studies show conclusively that spudding of a test well is not warranted. In the light of these provisions and the area earmarked for exploration it is evident that an intense and widespread wildcatting program is scheduled for Colombia for the immediate future, provided the necessary equipment can be obtained.

Wildcatting during the past twelve months period continues encouraging. Wildcats completed during the period July 1, 1943-1944 are listed in Table II, all of which were surveyed by Schlumberger. The outstanding operations in Colombia during this period are: (1) the development of Shell's Casabe field in the Yondo concession as revealed by the data of Table III; (2) the further proving up of the Socuava-Tres Bocas field in the Barco concession; (3) the promising oil and gas showings at only 630 feet, of Socony's Floresanto 1 test recently spudded in the Sinu River, Caribbean area. The oil is reported as of 42° A. P. I.

Wildcatting operations in the Magdalena Department which were commented upon in World Petroleum last year, carried out by Shell, have continued with promising results. The San Angel 1 which was spudded May 25, 1943 was

completed at a total depth of 9130 ft. as a non-commercial producer and gas well. This depth was reached at the end of January and since then until early in June of this year testing operations were carried out. A second test, located seven kilometers north of No. 1 is now rigging up.

El Dificil—Rigging Up Well.

TABLE II
WILDCATTING IN COLOMBIA, JULY 1943-1944*

Company	Drilling Contractor	Tract No.	Concession	Location Department	Well		Total Depth Ft.	Results or A. P. I. Status Gravit
1. Compania Colombiana de Petroleo el Condor	Shell	26	Yondo	Antioquia	Casabe	See Table 3		.....
2. Compania de Petroleo Shell de Colombia	Shell	74	El Doce	Magdalena	Brillante	1	10,250	Abandoned Showings
					Doce	2	4,000	Abandoned Showings
					Brillante	2		Locating
3. Compania de Petroleo La Estrella	Shell	96	Dificil	Magdalena	Dificil	2	6,120	Observa. text
					Dificil	3	4,950	Drilling
4. Compania de Petroleo La Perla	Shell	81	San Angel	Magdalena	San Angel	1	9,130	Gas well
						2		Rigging Up
5. Compania de Petroleo Shell	Shell	53	San Martin	Meta	San Martin	1	2,100	Fishing
6. Richmond Petroleum Co. of Colombia	Richmond	65	Arjona	Magdalena	Retiro	1	5,802	Abandoned
							1,525	Abandoned
7. Compania de Petroleos del V. del Magdalena	Socony	41	Cantagallo	Antioquia-Bolivar	Cantagallo (formerly Cimitarra)	2	6,170	260 B/D 20° API
						3	4,060	Abandoned
						4	6,881	Testing
						5	7,054	Drilling-Fishing
8. Sindicato de Inversiones	Socony	47	Floresanto	Bolivar	Floresanto	1	630	Drilling-Showing
9. Colombian Petroleum Company	Texas		Barco	N. Santander	Socuavo	5	5,675	Producer 32.9° API
						6		Preparing
						7	5,352	Producer 34.5°
						8	5,320	Producer 31.8°
						9	5,385	Producer 32.0°
						10	1,000	Drilling

In the Socuavo 3 new locations are being prepared.
Tres Bocas 6 new locations are being prepared.

Tibu	Locating		Three Tests
Tres Bocas	4	4,650	Producer 32.5°
	5	4,629	Producer 32.4°

*Continuation of list previously published in September issues of World Petroleum 1941-1943.

Note—Tract number refers to order of filing of concession applications, subsequently granted in contract. To date oil concession bid No. 256 has been filed since March 1931. . . Last year bid No. 145 was reported as of June 1, 1943.

TABLE III
DEVELOPMENT OF THE YONDO CONCESSION IN COLOMBIA DRILLING
March 12, 1941 to July 15, 1944

Casabe Well & Year Completed		Total Depth Meters	Feet	Initial 24 h. Production	Gravity A. P. I.	Days Lapsed Spudded-Completed	Average Ft./D Spudded-Completed
1941	1	2500	8200	456 B/D	22.0	222 days	37 ft./D
1942	2	1110	3640	140	21.2	40	91
	3	1085	3560	544	22.0	35	142
	4	1103	3620	214	20.0	50	72.5
	5	1100	3610	1230	21.2	33	109
	6	1220	4000	923	20.6	40	100
	7	1100	3610	544	21.3	44	82
	8	1143	3760	692	20.5	25	150
1943	9	1855	6080	468	20.8	89	68
	10	2237	7321	Dry	....	116	63
	11	110	3610	671	21.6	22	164
	12	1150	3780	468	21.4	20	189
	13	1150	3780	809	22.6	17	222
	14	1140	3740	797	22.3	22	170
1944	15	1262	4150	480	23.4	70	59
	16	1150	3780	886	23.8	30	126
	17	1150	3780	780	23.6	19	198
	18	1150	3780	334	22.8	26	145
	19	2033	6650	Drilling			
	20	1150	3780	400	22.0	28	139
	21	1150	3780	1100	24.0	61	89
Cano Negro	1	1657	5420	Dry			

In the Dificil tract No. 96, No. 2 was drilled to 6120 ft. and was completed as an observation well, being located outside the productive limits of the field. Dificil 3 is located one kilometer north of No. 1 which was reported last year as having been completed at 5950 ft. for 54 barrels per day of 45° A. P. I. oil and 700,000 cu. ft. of wet gas. This third test is now drilling below 5,000 ft.

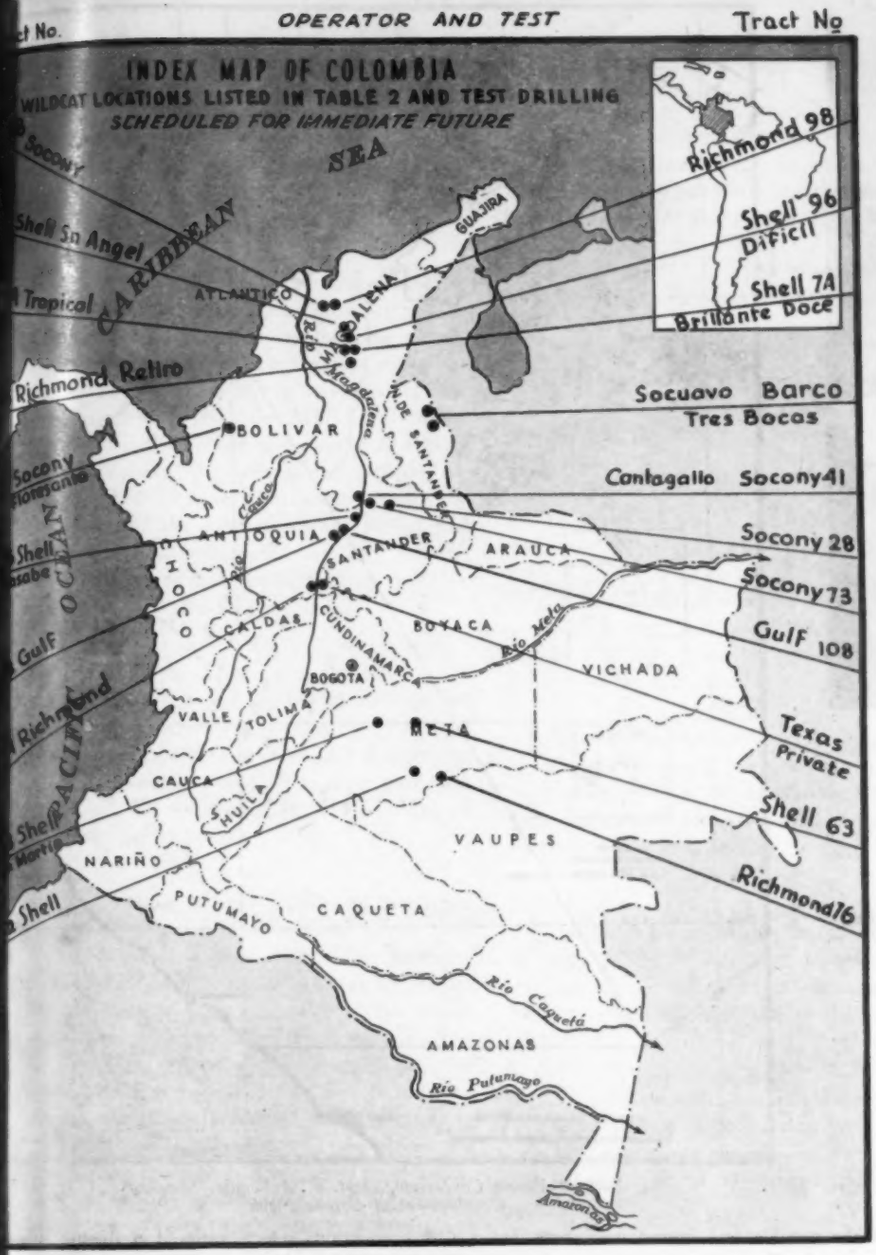
In El Doce No. 74 tract Shell has drilled two very deep tests; Doce 1 which reached the basement at 10,046 ft. and Brillante 1 which was abandoned at 10,250 ft. having obtained some high gravity oil showings. Doce 2, located midway between these two tests was recently abandoned at 4,000 ft. The fourth test for this tract is now being located in the northern or Brillante area. The tracts mentioned, 81, 74 and 96, were contracted on Nov. 27, 1940 for 81 and Nov. 29, 1940 for the other two. These are in the fourth exploratory year which expires November next. If the operator decides to retain the concessions he is obliged to submit an exploratory program which must include the spudding of at least two wells in each tract during the additional exploratory year granted.

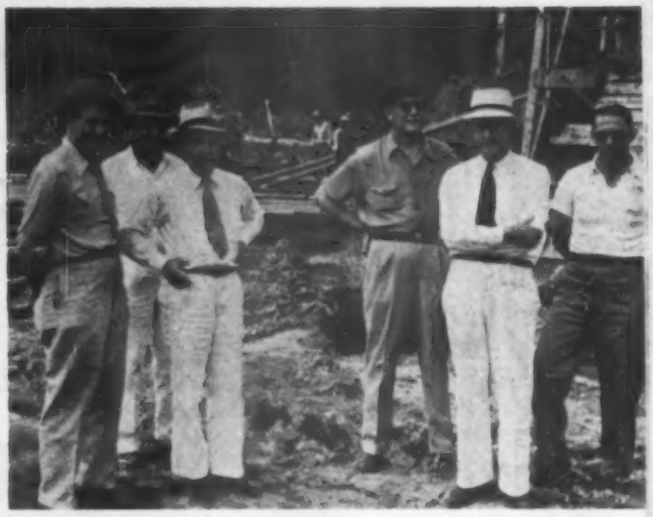
Socony stepped out in a new prospective oil region, in the Sinu River, Caribbean area, spudding Floresanto 1 in No. 47 tract on May 25. At 630 ft. oil and gas showings were encountered. Drilling was suspended for lack of a blowout preventer which is being rushed to the well site. The oil is reported to be high gravity, around 42° A. P. I. and having encountered it at such shallow depth has been a most encouraging surprise to the operator. Socony has an accepted application covering 50,000 hectares (123,500 acres) adjacent to the Floresanto tract and several other concessions bids filed with the Ministry in the same area. The proximity of these concessions to Caribbean tidewater, about 65 miles from the mouth of the Sinu River, is an extraordinary economic advantage which will permit a rapid testing and development of the concessions and will assure an adequate margin above exploitation and transportation costs. Some 1800 tons of fuel pipe, road building and drilling equipment were moved to the tract for spudding the first test. The rig is suitable for a 10,000 ft. test if necessary. The capital outlay and cost of drilling this first test is placed at not less than $550,000.

In the Mid-Magdalena valley Socony continued testing the Cantagallo No. 41 tract. Cantagallo 2 was completed at 6170 ft. as a producer of 20° A. P. I. oil and furnishes the fuel for the wildcatting operations being carried out. Test No. 3 was abandoned and No. 4 which reached 6881 ft. has not been fully tested for lack of testing equipment. No. 5 is now engaged in a fishing job at 7054 ft. and it is unlikely that it will be drilled much deeper. Socony has two concessions contracted; El Pedral, tract No. 73 right across the Magdalena River from Cantagallo operations; and further east, tract No. 28 covering Las Monas structure where Gulf undertook wildcatting some 20 years ago and obtained some promising results.

Shell continued the development of the Casabe field and to date 22 wells have been drilled in this concession. Casabe 21 located N. E. of No. 15 which has been undergoing testing operations has just been reported to have been completed for 1100 bbl. of 24° A. P. I. oil. The distribution of the wells is shown on the accompanying map. The index map gives the location of the Casabe field. It is of interest to note that the Yondo concession, contracted in 1938, is the first concession granted under the oil law that offers definite promise of shipping commercial oil and it will be the third oil concession in the country developed to a commercial stage. De Mares and Barco, contracted in 1919 and 1931 respectively, have been the first and second concessions that have been developed commercially, to date, in Colombia.

Directly south and adjacent to the Yondo concession Gulf is exploring tracts No. 108 and 78. Tests are scheduled to be spudded before March 9, 1946 and April 14, 1946 respectively in these concessions. Gulf has a geological party exploring the area and will soon have a seis crew on the ground. These two concessions, are part of the seven concession deal which the oil royalty enterprise "Regalias Petroliferas Colombianas" negotiated with Gulf. Two of the concessions





Left to Right: Dr. R. Shider, Asiatic Petroleum Co.; Dr. D. Trumpy, Shell's Chief Geologist in Columbia; L. P. Maier, Gen. Mgr. Tropical Oil Co.; Dr. O. B. Hopkins, Director, International Petroleum Co.; P. Shannon, Former Superintendent De Mares Operations; Mr. Linton of Shell, Visiting Casabe Field.

involved in the deal are further south on the same, or western, bank of the Magdalena River, tracts 46 and 77. The balance, tracts 130, 133 and 139 are in the Magdalena Department. Tract 130 is adjacent to Shell's San Angel and Dificil concessions. The Gulf-Regalias deal involved an option covering 300,000 hectares (741,000 acres).

Texas has been actively engaged in geological and geophysical exploration in the Departments of Bolivar and Magdalena as well as in the Mid-Magdalena river valley area and in the Llanos in the Caqueta-Putumayo region. The data of Table I reveals this activity. The Ministry recently accepted two concession bids, in the Caqueta-Putumayo region, where Texas carried out geophysical exploration, covering 200,000 and 100,000 hectares (494,000 and 123,500 acres) respectively. If commercial oil is eventually obtained in these concession it would seem that such oil may find an outlet via the Colombian tributaries of the Amazon river and the market will be Brazil and the east coast of South America. Texas is identified with a number of oil concession bids in the Caribbean area which have been solicited on the basis of extensive geophysical studies.

Texas is expecting to receive sufficient equipment in the course of this year to undertake three tests. One of these is scheduled for the Teran-Guaguaqui 127,205 hectare tract owned in fee, located about 400 miles from Caribbean tidewater, where at present road and camp construction are underway. The accompanying index map shows the location of this test. If sufficient and adequate equipment is made available, Texas plans to start two wells in the Caribbean coastal area, in the near future.

One of the most interesting wildcat undertakings in the country which the oil industry is following with keen interest is Shell's San Martin 1, spudded on February 3 last, located in a 100,000 hectare (247,000 acre) tract in the Llanos oil region. The San Martin test is the first ever carried out in the Llanos which is prospective oil region covering approximately 10 million hectares (25 million acres) wherein four concessions have been granted and some 35 concession bids, ranging between 100,000 and 200,000 hectares each have been filed within the past year. This oil region is at least 650 miles from Caribbean tidewater. Geologically it offers great promise as one of the future major oil provinces of the country. Numerous seepages along the foot of the Eastern Cordillera are encountered and one of these was sufficiently abundant that it was exploited commercially in the early part of the century. The San Martin test is equipped with a light rig but adequate for a medium-deep test, scheduled to go to 5000 ft. Some 500 tons of oil field equipment were moved to the concession overland for this test. The San Martin test is in a fishing job, around 2100 ft.

In the latest oil bill, which is due to be submitted to Congress in the course of this year, the government recommends a reduction in maximum concession areas in the Llanos, from 200,000 to 50,000 hectares (494,000 to 123,500 acres). One of the effects this provision would have, besides readjusting all pending concession bids which in itself would be a formidable task, would be to increase the drilling obligation. For the same area, hereafter, four initial tests would have to be spudded within four and a half years after the concession is granted, instead of one, as is now the case. Besides the reduction in area, the oil bill calls for a surface fee to be levied throughout the 30 year commercial oil period at the rate of three pesos per hectare per year. A 200,000 hectare tract would then be subject to a yearly payment of $139,000 yearly, in addition to a capital assets tax of 8 per mil, levied on the intangible and tangible investment in the concession. These levies would be payable irrespective of the amount of oil exploited.

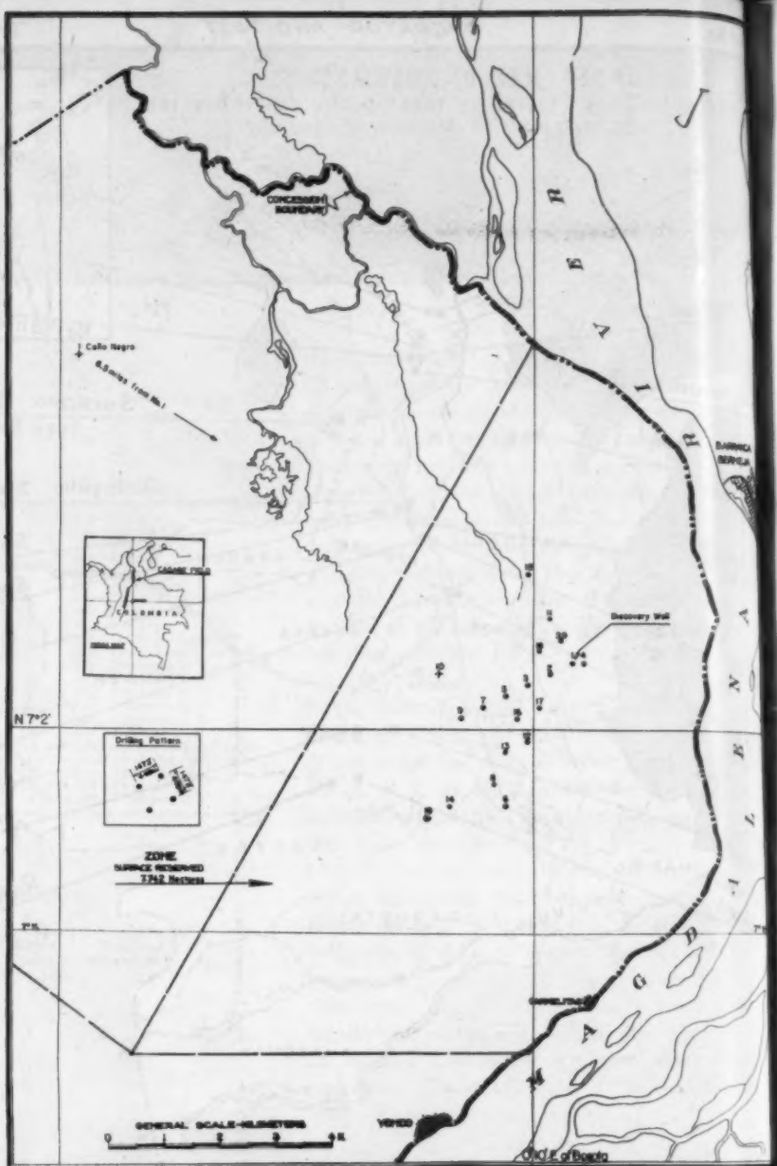
At present the oil law provides for a surface rental during the exploratory period by a 2 percent royalty payable at the maritime port of shipment. The latest oil bill, in addition to the surface rental, asks that a tax be levied up to 2 percent on crude oil exported. For Llanos concessions this may mean a 100 percent increase in the royalty payment over the percentage now in force.

NT IN BINDING

Top: Seismograph Crew in the Llanos.

Left: Seis Camp in Llanos District.

Right: Loading a Shot Hole in Geophysical Survey.



Part of Yondo Concession, Dept. of Antioquia, Showing Development of Casabe Field.

In making the above recommendations it has been overlooked that the Llanos oil region of Colombia is marginal oil land. If and when oil is discovered in commercial quantities commercial oil from the Llanos will require a pipeline to the Caribbean of not less than 650 miles in length, which, in addition, would have to scale the Eastern Cordillera of the Andes, between 8000 and 9000 feet above sea level, and could require a capital outlay of not less than 75 million dollars. In order to justify such a huge investment, a volume of oil must be found, which the author estimates between 600 million and one billion barrels. Exploited at a 4 percent annual rate would mean the shipment of 24 to 40 million barrels of oil yearly. The latter amount is about one third the volume the recently built "Big Inch" pipeline in the United States handles yearly.

Besides the great volume of oil required, a high quality crude must be found so that it will command an attractive price at seaboard and thus cover: the cost of exploitation; the pipeline tariff for this enormous distance; the taxes levied on the capital investment of the pipeline and of the field; the royalty appraised at port; and leave an adequate margin as net profit commensurate with the huge investment and great risks involved. Since the Llanos is marginal oil land, the proposed surface rental during the commercial oil period and the increased royalty through an export tax, might well be the factors in eliminating the Llanos from commercial development. This would eliminate half of Colombia's most promising prospective oil land.

In the Barco concession an intensive development program of the Socuavo-Tres Bocas field is being held up for lack of adequate and sufficient oil field equipment. This field may eventually prove to be 25 kilometers long by 4 kilometers wide, covering an area of 10,000 hectares (24,700 acres), figures which may serve as an index of the possible and immediate future development in the Barco.

To date 10 wells have been drilled in the Socuavo area, five in Tres Bocas and in addition, 13 new locations, including the Tibu area of the same field, are being prepared. Plans are underway which call for the construction of some 800 family dwellings for staff and workmen, a modern airport and an uptodate half-million dollar hospital. The future town and headquarters for the Barco will be Tibu, now being laid out and it is expected that eventually it will have 8000 population and possibly twice this figure.

Drilling carried out in the Barco is listed in Table II. The Socuavo-Tres Bocas field tests listed have been completed for potentials ranging between 300 and 500 barrels per day of crude running around 33° A. P. I. The Barco concession is equipped with 261 mile pipeline with the terminal at Covenas. At present it has three pump stations and a potential capacity of 25,000 bbl. per day and with additional pump stations it will have a capacity of 70,000 bbl. per day or 28 million barrels of oil yearly.

Oil production, which suffered a drastic drop during 1942 and 1943 due to lack of tankers has been regaining its normal level of around 2,000,000 barrels monthly. For the first five months of 1944 crude oil output has steadily increased from 1,284,000 bbl. for January to 2,085,000 bbl. for May and since then it has been maintained around this figure.

President Alfonso Lopez in his last annual message to Congress outlined the policy of the government with respect to the oil statute and the amendments proposed for the purpose of making it a more workable instrument. The essence of his thoughts on this important matter may be given as follows:

"Colombia is held to be among the richest in oil, but its oil bearing possibilities have not been even remotely explored. Purely legal difficulties have retarded the development of the country's oil industry, preventing Colombia from attaining a comparable position reached by other oil countries of the Americas. While in other countries the petroleum subsoil rights belong to the State exclusively, in Colombia we are still in

search of a formula to establish the boundary between private and national oil property. The controversy in this respect works against the strictly technical exploratory activities of the oil operators.

"The essential object of law is to grant security. Laws should not create uncertainty, discourage initiative nor obstruct the exploitation of oil. The government should make the oil law a workable instrument. If with the amendments proposed in the oil bill by the Minister of Mines and Petroleum we create an incentive to exploit oil in Colombia, the government may declare itself satisfied to have contributed toward the adjustment of the interests of the nation and those of the oil companies, opening, thereby, what promises to become the greatest field for cooperation with the foreign capital".

The Minister of Mines and Petroleum, Dr. Nester Pineda, has prepared the oil bill expected to attain the objectives outlined by President Lopez and it is due to be submitted to Congress at its forthcoming session. The main provisions of the oil bill as drafted by the Minister of Petroleum are as follows:

(1) Wildcatting is freely authorized in alleged private oil property, i. e. without having previously obtained a firm title. The Ministry should be advised of such undertaking and proofs are submitted to show ownership of the petroleum subsoil rights, so called for in the law. The matter is then referred to the Supreme Court for a decision. If the claims are upheld the operator continues with the respective lease, wildcatting and development operations. If the claims are denied, the operator is given priority to solicit the tract as a national concession. This formula is expected to permit the operator to litigate and wildcat simultaneously and thus avoid the great delays now current for obtaining a firm title before wildcatting may be started.

(2) Private oil rights are forfeited in favor of the nation, if (1) A drilling advice is not filed with the Ministry within five years after this law, (2) If the oil is not exploited within ten years. Wildcatting operations suspend this term (3) If the tract is the object of a concession bid and the corresponding opposition is not filed within sixty days for the purpose of excluding the tract from the grant (4) If in litigation now, such private oil rights are forfeited if the proper action is not filed within 90 days after this law.

(3) Private oil property, which means property with a firm title, may be leased hereafter only on the same terms as the national concession. The lessee would pay the lessor the royalty and to the government the private oil or severance tax.

(4) Maximum concession grants are reduced in size. In the Llanos from 200,000 hectares to 50,000 hectares and elsewhere in the country from 50,000 to 200,000 hectares. As mentioned above, drilling obligations would be increased inversely to the area.

(5) A tax on crude exported, up to 2 percent, would be levied during the commercial oil period.

(6) A surface fee of three pesos per hectare per year (69.5 cents acre/year) would be payable during the commercial oil period of 30 years granted to the operator.

(7) The drilling obligation clause which makes it necessary to spud a test, even if the technical exploratory findings do not warrant it, is modified. Hereafter a concession may be surrendered in the light of such findings, without having to spud a test in the concession.

(8) Drilling obligations due on concessions now in force would be suspended by the Ministry, in view of the difficulties of obtaining oilfield equipment and material, due to the world conflict.

In Colombia the oil industry is one of the most important sources of government revenue. Taking 1942 as a recent normal year, the role of the oil industry may be appreciated from the data of Table IV.

TABLE IV

	Pesos	Dollars
Ordinary fiscal income	77,015,000	44,000,000
Paid by the oil industry		
Income tax payments:		
Income	5,308,000	
Capital assets	1,500,000	
Excess profits	1,675,800	
Royalties:		
De Mares concession	1,209,924	
Barco concession	149,606	
Other payments:		
pipeline rights, Andian	229,327	
fuel supply depot	5,144	
surface exploration fees	146,326	
Total	10,223,327	5,850,000
Paid by oil industry percentage of ordinary income:	13.3%	13.3%

The data of Table IV clearly show the place of the oil industry in the national economy and the importance of the industry as a source of government revenue. If these benefits are obtained with an oil output amounting to only one percent of the world's total crude oil output, it is evident that the development of this important national industry should be promoted for the purpose of obtaining greater benefits in the future through an increased percentage of the world's crude oil production.

It is currently stated that due to a shortage of oil, the United States, which produces and consumes 65 percent of the world's crude oil output, will seek new oilfields abroad. Colombia is held to be a likely source in furnishing part of the future oil requirements of the United States. Fostering the development of the Colombian oil industry should be done for the purpose of obtaining the economic benefits indicated by the data of Table IV and not on the long term possibility of becoming a supplier to the consuming countries that are experiencing a shortage of oil and whose deposits may be waning.

If a shortage of oil prevails now, it may be expected that within six to ten years, or the minimum time period for discovering and placing new oilfields in exploitation, no shortage will exist and at that time supply will meet demand. The periods of shortage and abundance are known to occur in all industries, consequently they are not situations peculiar to the oil industry. During the last world cycle of oil shortage and abundance, 1920-1933, Colombia initiated the exploitation of its oil deposits when high crude oil prices prevailed. Because an oil shortage prevails and a rise in crude oil prices is foreseen for the post-war period, Colombia is again facing another economic opportunity to bring about a further and greater development of its oil industry. If Colombia expects to develop its oil resources on a comparable scale to other oil producing countries of the world, it can do so only if its development cycle is in consonance with the world oil cycle, characterized by periods of shortage and abundance, therefore, of high and low crude oil prices, whose time period is established by the oil exploitation conditions of the rest, or competing, oil producing countries of the world. If Colombia remains out of step with the world oil cycle, obviously the slow progress which has been characteristic of its oil industry, will continue.

Shell's San Martin Test in the Llanos.

Left: Quiriquire Hospital of Creole Petroleum Company.

Center Left: Typical of the Terrain in which Health Officers Have to Operate.

Center Right: Mosquito Control: Drip Barrel in Position Above a Drain.

Bottom: Part of the Caripito Camp in Eastern Venezuela.

PROTECTING THE HEALTH of Oil Industry Employees

Willard J. Denno, M.D.
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Standard Oil Company (N. J.)

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THE search for oil leads often to remote and sometimes to almost inaccessible places and many important fields have been found in areas utterly devoid of the facilities for health, sanitation and comfortable living that abound in more settled communities. Oil seems indeed to have made a habit of secreting itself in regions difficult of access, in jungle depths or beneath desert wastes. As a consequence, companies that follow the lure of petroleum to such undeveloped sections face many problems not met with by commercial organizations operating elsewhere.

Not the last of these problems relates to provisions for maintaining the health of company employees and caring for them during illnesses that are bound to occur. These activities must be adapted to a variety of conditions, ranging from those that surround small field parties engaged in surveys or wildcat drilling to those existing in fully developed fields where towns containing hundreds or perhaps thousands of persons come into existence. As exemplifying the organization of an oil company's medical staff and the range of its activities the accompanying account of the health program of the Standard Oil ompany (N. J.) and its affiliates in South America may be accepted as representative.

To begin with, it may be mentioned that a man who is employed by the company for service in the tropics receives a thorough physical examination and is not accepted unless he is in good health. If he qualifies all applicable immunizing protection is given him including vaccination against smallpox and inoculations against typhoid fever. If yellow fever or certain other diseases are known to exist in the area to which he is to be assigned inoculations against these diseases are administered. This is in accordance with the guiding principle of the entire medical program which is directed primarily to the prevention of disease.

Perhaps an exploration group is to enter a region in which no operations have been carried on previously. Studies are made of the known and probable diseases prevalent in that area. Sometimes a member of the medical staff has visited the district; often geologists who have made trips there are able to give helpful information. Whatever advance information is likely to help the members in avoiding possible infection is supplied to them.

These mobile field parties may be making a rapid inspection of a prospective oil bearing area changing camps each day as they progress. If they are making a geophysical survey they usually establish a base camp, generally far from a town or city, and from this camp make daily excursions for reconnaissance. A typical field unit will consist of one or more North American engineers, geologists or seismograph experts in charge of a small number of national employees. The ideal arrangement for the care of such field parties is to have a central medical organization controlled by a full time company physician well trained in tropical diseases and sanitation. Instructions then can be given directly to members of each group and new problems can be handled with full knowledge of local conditions. Where this is not possible, the next best plan is to have direct discussions with members of the group in the region where they operate.

These conferences deal with information of thoroughly practical value. The various methods of sterilization of water in the field are discussed. Precautions in selecting a suitable camp site even for a single night are carefully outlined. The men are especially warned against the use of abandoned houses as shelter as these often abound with insects which not only will prevent a restful night but may be carriers of several diseases. In malarious areas the use of mosquito nets, type of material, size of apertures and precautions to be observed are explained. If the net touches any portion of the sleeping man the mosquito, of course, can bite the individual without actually entering the net; also the few mosquitos within the net should be killed by insecticides or other means, as being imprisoned within the net would give them a perfect opportunity for biting. Where such measures are not adequate protection, the question of prophylactic medication is considered.

Naturally some provision must be made for common illnesses and accidents. A large first aid kit containing all essential medications for the treatment of common diseases and dressings for wounds together with specific instructions for use is provided. This usually is left at the base camp as when the men go out on their daily trips an individual kit is utilized. Replacement of the articles used in the individual kit is simple as all the contents are standardized and the base kit is used for their needed supply. Snake bite kits are provided as individual kits and anti-venom supplied when proper serum that does not need refrigeration can be purchased. Thus every possible precaution for preventing disease and provision for treatment of illnesses that may occur is provided these groups.

No matter how carefully a program is planned the human element is very important and many of the individuals belonging to these mobile parties really need an educational program. Usually the men enter the country in an excellent state of health and due to their initial resistance find that they do not need to take care of themselves at this period as carefully as they have been told. They are free from disease and tend to pay little attention to the small details so essential to good health.

As most of their work is over rugged terrain it is understandable that these groups wish to carry a minimum of weight but some of the inexperienced ones seem to prefer to "rough it" rather than to be burdened with adequate supplies.

They also become careless about the selection of proper camp site, adequate preparation of drinking water, personal care for treatment of minor cuts and insect bites. They find too that elimination of the mid-day meal saves a great deal of time and then at night they are too tired to prepare an adequate meal. As their first stage of high resistance to disease is gradually depleted it is easy to see how they can become ill from endemic diseases without really realizing that part of the cause of their illness was due to their own thoughtlessness. Whenever possible these points are stressed so that an increasing respect will be gained for the small but essential habits necessary to good health.

When a site is selected for a wildcat well a

Kitchen in One of the Company's Hospitals.

Outpatient Waiting Room at Quiriquire.

Laboratory of a Company Hospital.

larger force is required to do the drilling but their location is still regarded as a temporary camp until it is determined whether oil is obtainable in commercial quantity. The working force usually consists of fifty to seventy-five nationals under the supervision of several North American drillers. The camps are often located far from well populated areas and rarely close to a large town or city. Local medical attention is usually not available so it is of utmost importance to carry out as many preventive procedures as possible. Usually the reconnaissance groups have preceded the establishment of a temporary camp and some knowledge of the diseases present, terrain, etc., are known. The best available camp site is selected with special emphasis on adequate drainage and an ample supply of water. Also in malarial regions careful thought is given to the presence of swamps or bodies of water in relation to the prevailing winds.

It may be impossible to sanitate properly large nearby areas of swamps but if the camp site is on the windward side of a mosquito breeding area at least that is a great advantage.

When the foundations of the drilling rig are being laid it is a simple matter to construct a small concrete septic tank and to lay a few concrete slabs as foundations for the necessary habitations. This advance group of construction men determine the best water supply and how it will need to be treated for purification. A simple sewage system is provided and some method of garbage disposal is arranged. Thus before a main group of workmen move in the important elements of camp sanitation have been assured.

As the camp sites are used from three to nine months, depending upon the operations desired, it is entirely feasible to treat all employees for some of the common diseases. In many areas a large proportion of the national population has several kinds of intestinal parasites and it is profitable and easily possible for the entire group to be treated for the elimination of these parasites. Where malaria is endemic the suppressive treatment is used even though the screening is adequate and drainage good. The enforcement of all sanitary regulations is given to one individual who daily inspects the entire camp and sees that it is properly maintained in these respects.

Methods of transporting the sick or injured are established and these vary with the local conditions; in some areas travel by boat is the most feasible method, in others an automobile may be used and even transportation by air is at times available. Periodic inspection trips are made by the physician located in the central base of the operations not only to give actual medical attention but to be sure that the sanitary program is being followed according to his recommendations. Naturally when these employees return to their operation base after a varying number of months they receive physical examinations and helpful suggestions are made.

When exploratory drilling indicates that oil can be produced in commercial quantities in a particular area the question of establishing a permanent camp comes up for consideration. If such a settlement is to be established in a virtual wilderness the company necessarily must undertake all the functions of a municipality. It must provide streets, housing, light, a pure water supply and proper sewage disposal. Health hazards may decide whether the town shall be located directly at the field or some distance from it. If no satisfactory water supply is at hand one must be provided. In one instance it was necessary to lay water mains for a distance of ten miles to insure a safe supply of water. In another region where no water was obtainable near at hand the entire supply was brought in by ships from a considerable distance.

Another important consideration also develops in malarial regions. Even though we can sanitate the small confines of our own camps quite properly we cannot eliminate all mosquito breeding areas for miles around. Mosquitoes can fly or be blown by the wind for considerable distances, therefore, the location of the proposed permanent camp site should provide good natural drainage and the camp should be at a considerable distance from natural mosquito breeding areas which would be costly to control. If these vital elementary considerations are not economically sound, however, a failure of the entire commercial program will result.

When a permanent camp is established the responsibilities and duties of the Chief Medical Officer are rapidly multiplied. Naturally he must care for all sick and injured employees and in all camps far removed from adequate medical attention this service is extended to all the families as well. Also it is not unusual for national towns to start just outside the limits of the company concession or for a nearby town to enlarge considerably. In these places adequate medical attention is not always present and in all emergencies the company medical facilities are used for the care of these people having no connection with the company. In addition to any extensive anti-malarial program there are many other routine duties. Bacterial and chemical analyses must constantly be made of the water supply, the sewage must be handled in an efficient manner in accordance with our ideas of sanitation and also with respect to local laws. Refuse must be removed from every habitation regularly and destroyed in such a manner that insects and rodents cannot breed in these regions. When new construction is planned it is presented to the Medical Department for its approval in order to be sure that it will be both insect and rodent proof. If meat is purchased locally the animals should be inspected prior to and immediately after being butchered, then if cold

storage is to be employed it must be seen that these units are properly maintained. The manner in which the meats are finally cut must also be done under sanitary conditions. All other foodstuffs must be inspected and stored in such a manner that rodents and vermin cannot breed even should they gain entrance to the storehouse. The actual preparation of the food is often entrusted to servants and unquestionably certain diseases may be transmitted by unsanitary practice. It is, therefore, quite important that all food-handlers be examined prior to the employment and periodically thereafter and treatment administered when necessary to prevent transmission of disease.

As the community increases in size the company not only builds its own commissaries, restaurants and schools but considers that worship and recreation are also essential parts of normal life. Churches are encouraged and sometimes built entirely by the company; clubhouses are constructed where tennis courts and bowling alleys are always popular. Often a swimming pool is added which is a very desirable feature but which must also be maintained in a sanitary manner under the supervision of the Medical Department.

The personnel are not neglected and periodic physical examinations are performed on all employees and on the families of certain groups. Periodic smallpox vaccinations and typhoid inoculations are given all North Americans prior to their vacation period and also given to the national group when advisable.

Thus it is seen that the Medical Department performs not only the duties of a private physician and industrial physician but also those of a Board of Health with far more exacting standards than in most large cities in the United States. It is impossible for one individual to carry on all these duties and for a large established camp several physicians with unusual capabilities are required.

Below: In the Operating Room of a Camp Hospital.

Bottom: Semi-Private Ward, International Petroleum Hospital at Talara, Peru.

When the Medical Department is consulted prior to the embarkation of any commercial project in the tropics it can easily be seen that the knowledge of the local conditions built up bit by bit over a period of several years gives invaluable information and will not only be important in deciding if a commercial program in the tropics is economically possible but also what unusual circumstances are probable and a definite idea of their magnitude. It is apparent that the proper selection of a camp site is of tremendous importance both from a health and economic standpoint. The Medical Department has many and varied responsibilities which are exceedingly important beginning with the time the first reconnaissance groups enter the country and continuing as long as the established camp is maintained.

Physical Examinations: It is extremely important to know at all times that the health of the individual is capable of permitting him to perform his duties properly. Before any individual is sent to any concession a complete physical examination is performed. If he is transferred from another company a physical examination is recorded prior to his transfer. Thus we are assured of an accurate picture of the general health of all employees. While there are definite standards of health established these naturally vary with the type of work and the environment in which he is to be placed. Thus an individual who might be physically unsuitable for an active exploration group could be advantageously located in a permanent camp. It is also important that periodic examinations be given to maintain them in the highest state of health possible. The time interval varies with the type of work and age of the individual. The members of the field parties may be examined each time they return to their base at two to three months intervals or those residing in a permanent camp only at 18 months intervals. Generally speaking however as the age of the employee increases the periodic examinations are more frequent.

Sometimes in the larger camps the employees must do unusual types of work with various materials. If toxic materials are handled or the type of work has the possibility of causing illness all precautions are used to prevent disability and also various kinds of special medical examinations are performed as often as necessary.

We have previously stated that certain diseases can be transmitted by food handlers, thus it is most important to see that disease is not disseminated by the group of individuals. At six month intervals all food-handlers; cooks in private homes, waiters in our restaurants and vendors of foodstuffs, are examined for the presence of contagious diseases and intestinal parasites,

with special emphasis on amebiasis. Those individuals that can spread disease are not allowed to resume their occupations until appropriate treatment is rendered. In one camp before this regime was instituted the lost time rate due to amebiasis was 36.8 per 1,000 and after one year of treatment of foodhandlers the rate dropped to 4.9 per 1,000. In the past two years there have been no cases losing time because of this disease.

Prevention of Endemic Disease: In one locality in the tropics a company had been operating in an endemic malarial region without sufficient attention being paid to this important disease. The accompanying chart shows that prior to the inauguration of an adequate anti-mosquito program the malarial rate was extremely high. In 1926 the rates were so excessive that it became necessary to inaugurate an intensive anti-malarial campaign. This work was started in 1926 and its maximum efforts were accomplished in 1927 and 1928. The important features were the provision of adequate drainage, filling and leveling where necessary, oiling areas that were not suitable for drainage and Paris Green spraying where oiling was not feasible. This may sound like a very simple program but these were a few of the natural disadvantages. Various species of mosquitoes that carry malaria were present. Some preferred to breed in open sunlight in large pools, others preferred small depressions in the earth and still others selected the quiet eddies of slow moving streams. The rainfall was over 100 inches a year and wherever the drainage was not perfect there was a possible breeding area. Ditches were laid to provide complete drainage which were adequate as long as the foliage did not obstruct the ditches and did not dam up the small depressions in the areas being drained. In this locality the foliage grew very rapidly and it was necessary to maintain a sanitary group for the special purpose of cutting the high grass and keeping the drains clear of debris. All small depressions were filled and irregularities that would form pools after a rain were levelled. Some swamp areas could not be drained, these were treated by clearing the edges of the swamp so that the oil could reach the entire surface of the pool and applying crude petroleum to such an extent that a thin film was present over the entire surface for at least one day a week. Where because of certain difficulties it was not feasible to use oil it was found possible to spray Paris Green over the bodies of water that could not be otherwise treated. In certain cases larvacidal fish were introduced into pools that could not be treated in any of the previous ways.

These anti-mosquito measures were helpful but other devices were also of value. All houses were completely screened and mosquito proof, double screen doors were provided wherever possible, insecticides were used in adequate amounts for those mosquitoes that did gain entrance to the houses. Where it was necessary for employees to work out-of-doors prophylactic medication was used. All inhabitants were cautioned to remain protected during the hour of sunset when the majority of mosquitoes prefer to bite. All persons having malaria were promptly and adequately treated to prevent the spread of this disease.

Postgraduate Study: In order that our physicians both national and expatriate may be kept abreast of modern trends of medicine and its allied branches the company sponsors graduate studies in this country. Each graduate student is given ample time in Class A universities for a comprehensive review of the subjects with which he is conversant and to learn new methods of diagnosis and treatment.

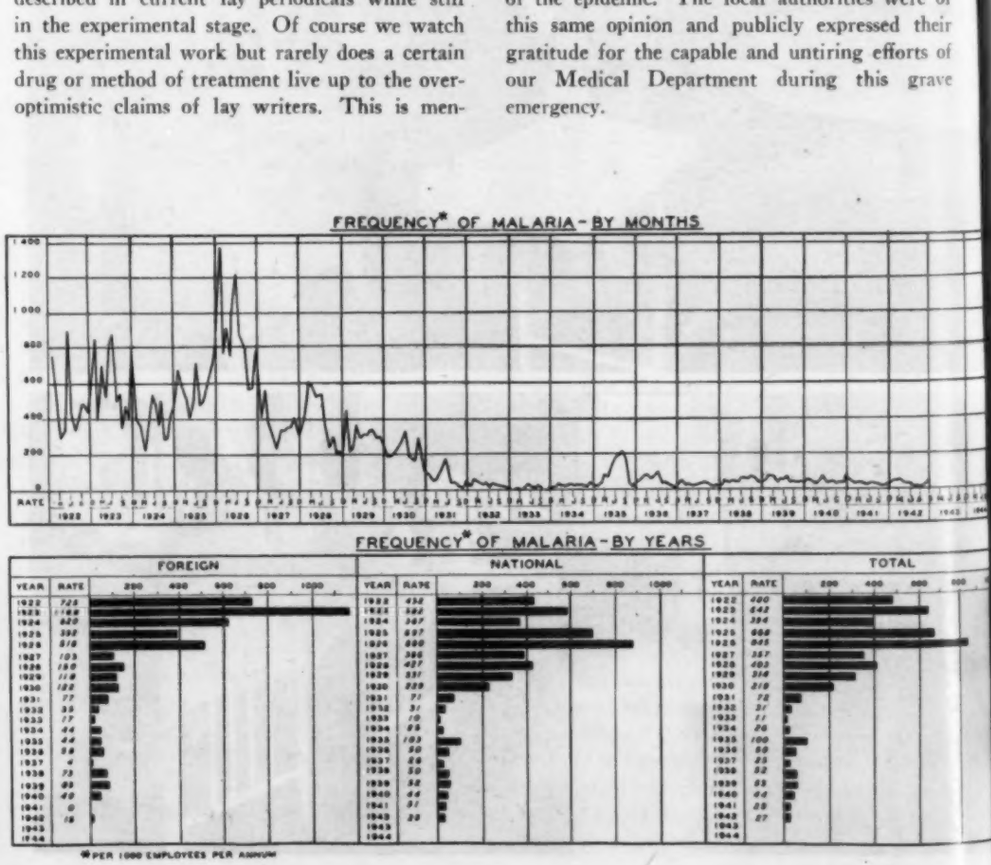
Undergraduate scholarships are also granted in various subjects including medicine.

Such studies are proven value to industrial organizations and should be encouraged.

Treatment of Disease: Our general policy in this regard is exceedingly conservative. We continue treatment in the proven accepted methods until it is quite certain that some newer method is superior in all respects. Additional study by means of postgraduate training is often very important for the evaluation of these changes for even though a certain treatment is publicized the acknowledged leaders in the profession will not endorse a method until they are assured that the results will be better than the established treatment. Often some new treatment is glowingly described in current lay periodicals while still in the experimental stage. Of course we watch this experimental work but rarely does a certain drug or method of treatment live up to the over-optimistic claims of lay writers. This is mentioned not only to be deplored but is another point in favor of postgraduate training in order that our physician may be fully informed of those methods which are practicable and those which as yet are not acceptable.

Cooperation With Government Agencies: At all times our Company physicians fully cooperate with the respective government offices. Whether it is a matter of public health, sanitation or other medical problems of public welfare all of the facilities of the medical departments are placed at the disposal of the proper authorities. Recently an outbreak of smallpox occured in a village not far removed from one of our camps. We were not at all disturbed regarding the health of our own employees and their families as they all had been recently vaccinated and were thus immune. However, in the interests of the public health of the community and of the state our own physicians expended every effort to control this epidemic promptly.

Cooperating to the fullest extent with the government agencies our physicians materially assisted them in the establishment of a contagious disease ward for those already ill. The services of our doctors, nurses, and technicians also made available for the treatment of this disease. A protective cordon was established and maintained and mass vaccination inaugurated. Although ninety-five cases occured in the three weeks of this epidemic we feel sure that the immediate assistance our Medical Department was able to give profoundly affected the favorable course of the epidemic. The local authorities were of this same opinion and publicly expressed their gratitude for the capable and untiring efforts of our Medical Department during this grave emergency.



Leading Causes Of Disability: Since the establishment of our tropical medical departments each unit sends in a record of every lost time case in the form of register cards. These register cards show age, status, length of service of employees, diagnosis, operation, disposition, number of hospital days and number of days of disability. While we obtain these on all individuals whether employees or not we have little control over the non-employees and only use employees records for statistical analysis. During a year we receive from our tropical groups about 14,000 register cards representing the illnesses of about 26,000 employees. These reports are carefully analyzed as soon as they are sent to us and each year a statistical report is fowarded to the various companies. These reports show just how the frequency of certain diseases has changed during the year and also how the duration of these diseases has been affected. These studies are invaluable and permit prompt detection of any unusual trends so that any necessary measures may be promptly instituted.

The rates of frequency of diseases are considered per thousand employees and they show some interesting figures. We find in the tropics that the most common cause of illness is the common cold accounting for 21% of the sickness disability. This frequency is 94.8 as compared with 216.7 as the average figures for the United States. Minor gastro-intestinal diseases are the second most common lost time illness amounting to 12% with a frequency in the tropics of 54.0 as compared to the rate in this country of 66.8.

Malaria being endemic in many tropical areas can easily be a major cause of disability but we have previously shown how this rate can be decreased if appropriate measures are taken in regions where these are practicable. Influenza is much less common in the tropics, the frequency there being 15.8 against a United States rate of 71.8 All together our figures show that although there is naturally some variation of diseases due to the different environment, the general health of our communities compares quite favorably with that of any healthy community here in this country.

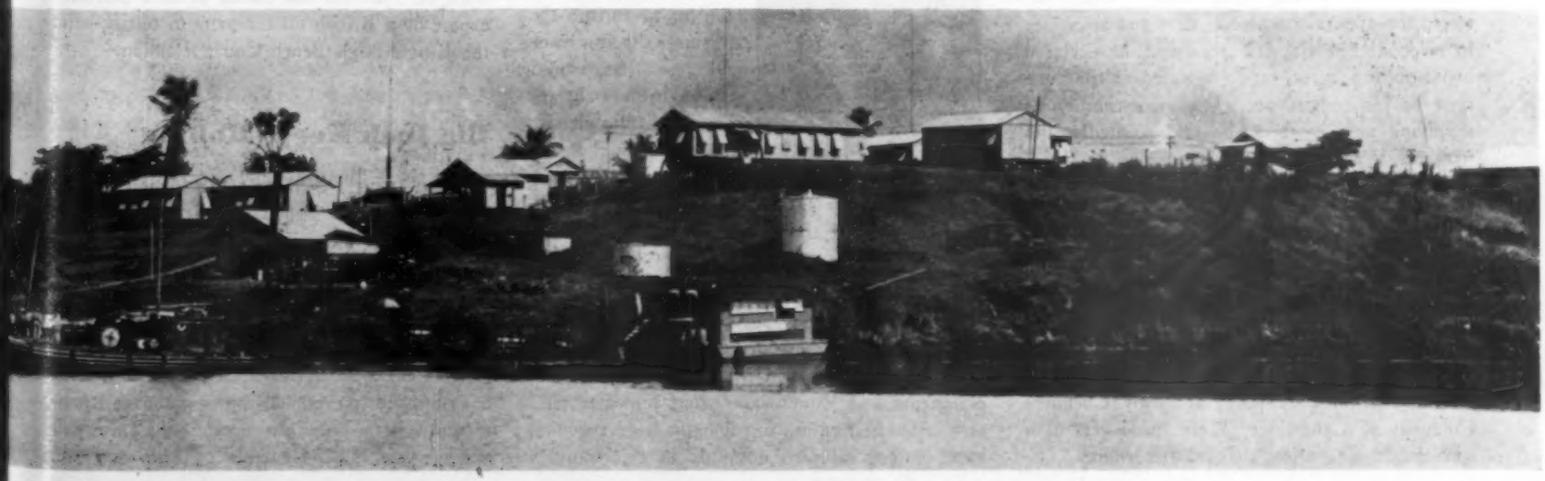
Equipment of Hospitals: In every permanent camp a well equipped hospital is one of the first requirements. In outfitting these units no expense is spared in obtaining the very best quality of materials which in the long run has proven to be sound economy. Every hospital is equipped with a first class X-ray machine and an adequate diagnostic laboratory. Operating rooms are often air-conditioned and the efficient lighting equipment found in the most up-to-date hospitals are usually seen in our operating rooms. All surgical instruments are of excellent quality and when the annual inventory is made replacements are then considered so that the instruments are continually kept up to the needed requirements. The construction of the hospital too is given every consideration and adapted to the climate. Particular attention is paid to insure spotless cleanliness without excessive maintenance and whenever possible the floors and occasionally portions of the walls are made of some lustrous hard finished material such as glazed tile or terazzo, both of which are quite easy to keep clean. Naturally all necessary precautions are made to render the structure vermin and rodent proof. The accompanying pictures show the exterior of one tropical hospital and interior views of similar buildings.

The average American visiting one of our Company camps or an employee new to the tropics is not at all impressed by much of the work of the Medical Departments. In this country one takes for granted that when you turn a faucet pure, clear water will flow and that there is nothing unusual about the fact that a flush toilet actually works. It is rarely realized what a tremendous amount of work had to be done to enable him to perform these simple acts. The proper site for the water supply, the various purification procedures, the huge tanks for flocculation and storage, the long piping system, the sewage disposal arrangements where usually large tanks partially purify the sewage before it enters a stream; all these are matters he has never thought of nor is he aware of the difficulties encountered in their construction and maintenance. Even after a full water system is built constant care must be exercised to maintain the water bacteriologically pure and the disposal system adequate. Usually he is not aware that the meat bought in the local commissaries has undergone a rigid inspection to insure its wholesomeness nor that the clerk must have periodic examinations in order to protect the purchaser. Thus it is seen that the industrial tropical physician has a multiplicity of duties, beyond those of the practioner in this country, for the health of the entire community depends upon his industry and the application of his knowledge. So much of this important work is taken for granted that many people do not realize how essential is the work of the men in these organizations.

Naturally the construction of the various buildings, the laying of sewer pipes, the repair of mosquito screens, etc.; these are all done by the other departments. In all of our problems we fully cooperate with all other departments and often we would be unable to carry out a proper medical program if it were not for their generous support. The Managements of course have the final decision in all expenditures but as a general rule they are willing to accept a reasonable medical program even though the returns can not always be measured in dollars and cents.

When a tropical property is to be developed one of the first steps should be the organization of an efficient Medical Department whose members are particularly qualified for this work. Unless the health conditions are satisfactory and are kept at an acceptable level the commercial project will not be successful.

Temporary Camp at Pedernales.



★ ★ ECHOES FROM THE WASHINGTON OIL FRONT ★ ★

By W. J. Maddox, Chief of World Petroleum's Washington Bureau

Dewey Finishes His Job

Col. Bradley Dewey

FROM here out what remains to be done to carry on the synthetic rubber program is up to the rubber division of War Production Board. The Rubber Administration, in what is probably the first voluntary liquidation of a war agency, passed out of the picture September 1, at the request of its director, Bradley Dewey, who submitted his resignation to War Mobilization Director Byrnes July 25.

Colonel Dewey's action was based on the belief that the job assigned his office by the Baruch committee — to get the synthetic rubber program "bulled through" — had been accomplished. A synthetic rubber industry, he told Justice Byrnes, has been established and is in complete operation, and is providing the nation with an ample supply of rubber. However, he warned: "From this point on the problems incident to converting the new synthetic rubbers to goods essential on the military and home fronts are substantially the same as the more or less routine problems facing every great industry in war time. With rubber itself no longer a problem, success or failure in the future will depend upon whether sufficient tire cords, carbon blacks and particularly manpower are provided to the rubber goods manufacturing plants".

Dewey left office with the belief that while his job was done, the nation still faces a rubber crisis growing out of the shortage of heavy duty bus and truck, airplane and tractor tires. "Less than 6,000 additional workers — about half the number to be strong, husky men — stand between the present shortage of tires and an ability to meet all essential requirements," he declared in his sixth progress report released at the same time as his resignation. The responsibility of supplying new workers, he said pointedly, lies with the War Manpower Commission.

Dewey came to Washington about two years ago, when the rubber office was created, as deputy to William Jeffers, president of the Union Pacific Railroad, and the nation's original rubber "czar". He succeeded to the post of director when Jeffers returned to railroading about a year ago. Dewey was a dollar-a-year man, on leave as president of the Dewey & Almy Chemical Company of Cambridge, Mass., producers of a special purpose variety of synthetic rubber.

Senate's Say on Oil Policy

NOW that Great Britain and the United States have completed their discussions on post-war oil international trade, Senator Maloney's oil policy committee may be expected to assume a more active role. Under a tacit agreement that he would be kept informed of the course of the negotiations between the missions representing the two governments, the Senator has kept pretty much on the side lines. But since the "broad principles" for handling world oil have been agreed on, Maloney is free to go ahead with his study of domestic and foreign oil policy from the viewpoint of national interest.

It had been thought that the new compact between Britain and the United States would be submitted to the Senate, probably through the Maloney group, for approval. The question has been raised, though, whether the agreement is a treaty or an executive document. As a treaty, the proper committee to refer it to would be Senator Conally's Foreign Relations.

It is understood Conally is willing to consider the agreement an executive document, and it probably will not be submitted for Senate approval. However, it is understood that the multilateral agreement to be drawn up when the other oil producing countries come in will go to the Foreign Relations Committee.

Suggested for I.P.C.

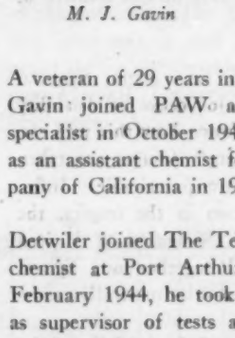
Ralph K. Davies

AS for the four representatives of the United States to be picked for the new International Petroleum Commission — here's one name your correspondent tosses into the ring as a likely choice and one that would receive universal approval — Ralph K. Davies. Whether he would accept the job or not would remain to be seen, but a good case can be made for this selection.

His three and a half years — and he's not through yet — as Deputy Petroleum Administrator have given him an insight into all departments of the oil business. He has breadth of experience and "know how" that few men possess. Also he has an exceptionally wide acquaintance among oil men not only in this country but throughout the world — a real asset on such a commission. And they have confidence in him. As a member of the Anglo-American conference, he played an important role in the negotiations.

As to the chances of his accepting — well, Davies has a tremendous loyalty to the industry and to the government. His unfailing devotion to the job of oiling the war has proved this. Such a job would mean a big financial sacrifice to him personally, but maybe if the need were put up to him strongly enough.

Foreign Division Promotions



M. J. Gavin

CONGRATULATIONS go to M. J. Gavin and J. C. Detwiler on their promotions to be assistant directors of P A-W's Foreign Refining Division. Gavin's duties will relate to the facilities side of the division, while Detwiler's primary responsibility will concern the operations of foreign refineries.

A veteran of 29 years in the petroleum industry, Gavin joined PAW as a foreign petroleum specialist in October 1942. He began his career as an assistant chemist for the Union Oil Company of California in 1915.

Detwiler joined The Texas Company as a work chemist at Port Arthur, Texas, in 1911. In February 1944, he took leave from his position as supervisor of tests and specifications in the refining division of the company to join PAW's foreign division as a petroleum technologist. Back in 1926 he was called in as a petroleum expert by a British oil company to testify before the King's High Bench Court, London.

Big Inch Keeps Rolling

"BIG INCH" — the world's biggest oil pipeline — began its second year of full-length operation from Longview, Texas, to the New York — Philadelphia area, August 14. During its first 12 months' operation it delivered some 96,292,000 barrels of crude from Texas fields to eastern refineries. Designed to pump crude at the rate of 300,000 barrels daily, the "Big Inch" has consistently exceeded this rate since all pump stations were put into operation. July daily average was 314,134 barrels.

Above: Bulk Distributing Plant at Guaymas Serving an Extensive West Coast Area.

Right: Refining Plant on the Northern Bank of Panuco River, Near Tampico.

MEXICO PREPARES BROAD PROGRAM
Of Oil Industry Expansion

Refinery Reconstruction, Intensified Exploration and Building of Many New Pipe Lines Held Necessary to Meet Growing Domestic Needs and Anticipated Export Movement.

WITH the prospect that the end of the war may not be very far distant Mexico feels renewed hope of being able to carry through plans for the rehabilitation and expansion of her oil industry which have been reluctantly deferred for the past three years. During most of that time a special petroleum section set up in the Mexican Embassy in Washington has been engaged in straightening out unsettled issues between the two countries and in endeavoring to obtain equipment and supplies to meet the most urgent needs of Mexico's oil industry.

From time to time a certain amount of drilling and refining machinery has been released by government bureaus in Washington for shipment to Mexico but the amount has been limited by the tremendous requirements for military use which have absorbed virtually the full capacity of manufacturers in the United States. Of the equipment covered by the few contracts Pemex has been able to place, comparatively little has been delivered. Meanwhile the variety and extent of the materials needed to put the Mexican oil industry in an efficient operating condition naturally have increased with the passage of time and now reaches to every branch of the business—production, transportation, refining and marketing. While Mexico's once flourishing export trade in oil has been in eclipse since the war started a very great increase in domestic demand has taken place under the influence of the wartime prosperity brought to the country by the sale of mine products and other war materials to the United States. As a result the machinery for the distribution of petroleum products within the country itself has become wholly inadequate, resulting in many places in shortages that have given rise to much complaint.

Most noteworthy of the concessions obtained by Mexico's representatives in Washington was authorization for refinery construction, including a unit for the production of 100-octane gasoline using materials to be shipped from the United States and supported by a loan of $10,000,000 from the Export and Import Bank. This enterprise has been usually referred to in press reports as a new refinery. It will be virtually that so far as equipment is concerned but it is based on the reconstruction of the Aztcapotzalco plant, located in a suburb of Mexico City, which was owned and operated by the Mexican Eagle Company, subsidiary of the Shell interests, prior to expropriation. With the addition of the high octane unit the plant is scheduled to produce 1,000 barrels daily of aviation gasoline, 14,000 barrels daily of commercial gasoline and 15,000 barrels daily of fuel oils. The design and engineering supervision of the plant's construction is in the hands of Arthur G. McKee & Company of Cleveland, U. S. A. and it is reported as one provision of the $10,000,000 loan, which is understood to be repayable either in cash or products over a period of years, that a technical director of operations appointed by or acceptable to the United States authorities will be put in charge when the plant is completed.

The provision for the production of high test aviation fuel from this plant is considered important in order to provide for the needs of the Mexican air force and also to supply blending material for upgrading motor gasoline. The completion of this plant will give Mexico one thoroughly modern refinery. It is admitted by the management of Pemex, however, that all other refineries in the country are inefficient and badly in need of modernization. One of the claims made by the Mexican authorities in the controversy that followed expropriation was that the companies had allowed their refineries to run down and that their actual value was much less than the companies claimed. As scarcely any new equipment has been installed in the six years since the government took over the properties the statement as to their obsolete condition at present can hardly be questioned. Plans for the improvement of these other refineries are under consideration but as actual construction work on the Aztcapotzalco plant will not begin until the latter part of this year the execution of these plans probably will be deferred until later.

According to the annual report of Petroleos Mexicanos refinery runs during 1943 amounted to roundly 33,500,000 barrels or 91,790 barrels daily as compared to 30,600,000 barrels, an average of 83,840 daily, in the year preceding. The report explains that these runs were limited, not only by capacity of the refineries but by the amount required to cover domestic needs and the relatively small export movement.

Bulk Distributing Sub-Station at Culiacan.

Production of crude is reported for last year as 33,795,000 barrels compared with 32,955,000 barrels in 1942, a rise from 90,000 to 92,600 barrels daily. This is much below average pre-war production but the Pemex report explains that the policy now being followed is to adjust supply to domestic and export demand and to prolong the productive life of the fields and to realize the maximum ultimate volume of yield from them. Nevertheless the company management has in view the restoration of the export movement after the war and realizes that in order to provide for that, along with the rapid growth in internal demand, an extensive program of exploratory and development drilling must take place. An insignificant amount of drilling has been done for several years past and it is admitted that the recovery rate in some of the older fields has been declining for some time past. The budget for the current year carries an allotment of 8,500,000 pesos for surveys and exploration as against 3,500,000 pesos appropriated for the purpose in 1943. The great Poza Rica field which came into development shortly before expropriation remains the mainstay of current production. It was announced recently that equipment purchased in the United States would shortly be installed in the Poza Rica zone to stabilize production which, it is stated, has been increased to more than 65,000 barrels daily.

While the plans of Petroleos Mexicanos contemplate the drilling of no more than 20 exploratory and 32 exploitation wells this year a much more extensive program will be inaugurated when it becomes possible to obtain the necessary machinery and materials.

The plans include geophysical surveys and wildcat drilling in the northern part of the country below the Texas border which is considered a promising area and was in fact marked for development by the private companies before they were expelled. Pemex is now conducting geological explorations in Tamaulipas, on the Gulf Coast, and in some other regions to discover oil deposits.

In view of the extensive discussion that has gone on in the United States about the size of the country's reserves and the probable date of their exhaustion it may be of interest to note that the latest official estimate of Mexico's known national reserves places them at 78,000,000,000 barrels. This would provide for sixteen to eighteen years supply at a normal rate of production but nobody in Mexico seems to be alarmed over this situation or to anticipate that the country will be faced with a lack of oil by the end of that time.

While precise information about current oil production continues to be withheld in official quarters, a slight drop of four percent in the daily output of the northern zone, which includes the Poza Rica, Naranjos and Panuco fields, is admitted. The decrease in production in the Tampico belt was attributed to a falling off in runs from the Panuco fields. Production in the Isthmus of Tehuantepec fields, it is said, remains practically unchanged.

Pemex is moving now for the solution of one of its most pressing problems, that of providing adequate transportation for the distribution of its products throughout the country and establishing facilities which are expected to be needed before long for stepping up export deliveries. Mexico's railway system has been in poor condition both as to line and rolling stock for a long time and the increased volume of business resulting from the demand for war materials has placed it under a strain that has demoralized traffic from time to time. Many of Mexico's industries, including her two greatest ones, mining and agriculture, are being handicapped by a sharp shortage of gasoline and other oil products. This condition, it seems, is due mainly, if not entirely, to faulty transportation service, mostly rail. Conditions are particularly bad in the provinces, including such important industrial centers as Guadalajara, capital of the key western state of Jalisco and the Republic's second largest city, and Monterrey, an important center of steel production, on the eastern border. Some factories there have found it necessary, on frequent occasions, to suspend work, while others have been obliged to curtail operations because of this shortage. Bus, truck and other automotive services in these and smaller cities have been hard hit too and the general public has been greatly inconvenienced.

Two large mining companies, Kildun and Santa Maria de la Paz, both in San Luis Potosi, employing thousands of men, frequently have been forced to stop work because of the lack of gasoline and fuel oil. Several smaller mining companies have been similarly embarrassed. Inadequate home transportation, to some extent, is also hampering export shipments. Tampico is about the only export center that is able to handle such shipments promptly and uninterruptedly.

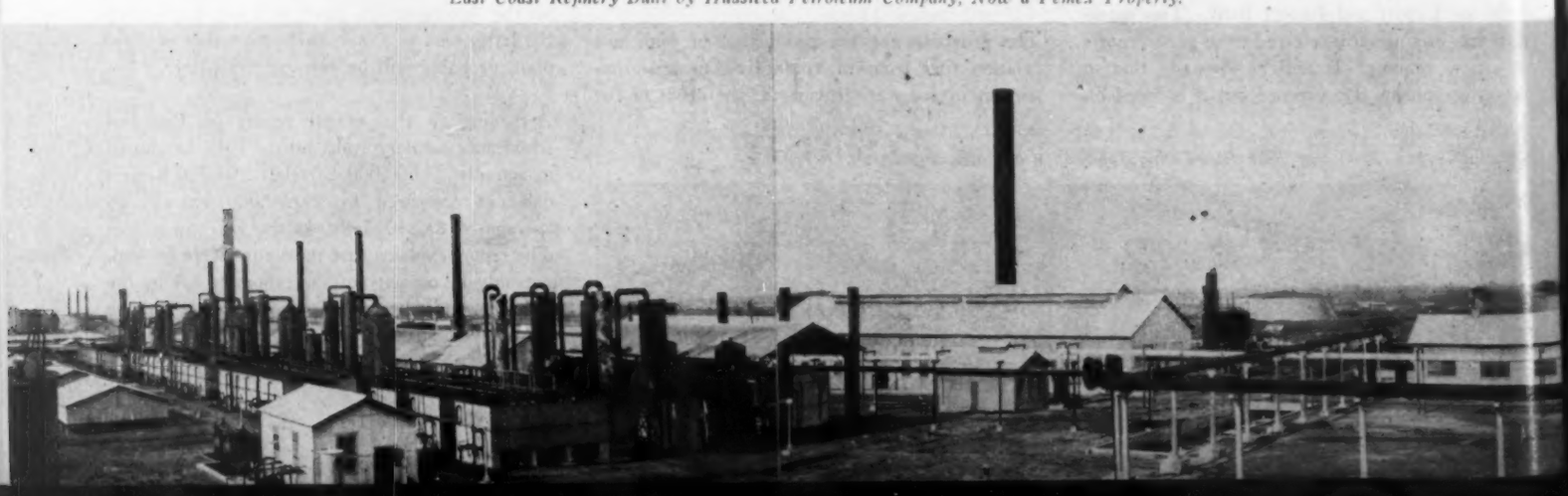
Mexico's largest railroad, the National Railways, government-administered, for the rehabilitation of which a committee of rail experts from the United States has been working for some time, has not been able to cope with this situation. Tank car shortage, haulage difficulties and a scarcity of locomotives, are the chief factors in the railway's irregular deliveries of oil and oil products. Attempts to relieve conditions by purchasing tank cars from the United States have been thwarted by the requisitioning of all available cars to transport the oil formerly carried by tankers on the Gulf-Atlantic Coast run.

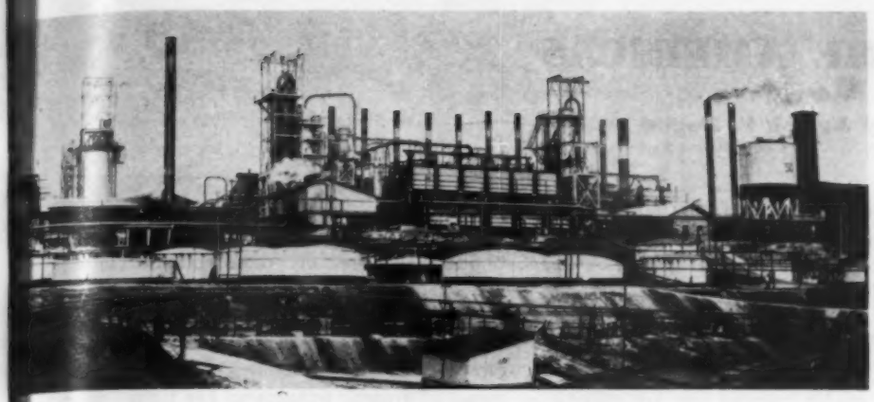
Therefore, Pemex seeks the solution to its problem in the extensive pipeline construction program it has arranged and expects to launch soon. This elaborate project of new building will be the greatest in the official oil company's history and one of the most ambitious in the forty-three year life of the Mexican petroleum industry.

The program features a transcontinental oleoduct, claimed to be the first in the Americas, that is to run from the Tampico fields to Mazatlan, key Pacific port, distribution center for the entire west coast belt. The estimated cost of this pipeline is 15 million pesos. Pemex calculates that it will require two years to build this line and place it in operation. The line is counted upon to afford prompt and sustained oil and oil products deliveries from the hub of production to rather remote but nevertheless important centers. The attempt to correct faulty rail deliveries to the west coast by tanker shipments via the Panama Canal has not been very satisfactory even as a temporary expedient. War conditions are a big obstacle to that roundabout system which entails a trip of some 7,000 miles to cover a little more than 1,000 miles across country.

The Tampico-Mazatlan line will have facilities for moving certain by-products besides oil. Pe-

East Coast Refinery Built by Huasteca Petroleum Company, Now a Pemex Property.





Refinery at Minatitlan Formerly Operated by El Aguila.

On the Mexican Section of the Pan-American Highway.

mex figures that costs of establishing the pipe line will be retrieved within two years from the time it is inaugurated. The line will be of particular value in reaching the north western part of the country which now finds much difficulty in obtaining oil and its products. Pemex calculates that monthly profits from this pipeline will be at least one million pesos.

Mapping the location and route of this pipeline has been completed by the company's engineers, Trevino and Guerrero, after months of work in the field and in the offices. These plans, details of which are being withheld at present, include the location and capacity of pumping stations that will service the line, as well as the construction of a special refinery to treat products which the pipe line will move.

The company has decided to build two other large pipelines that will traverse a considerable section of Mexico but will not be transcontinental. The decision was made public by the senatorial and congressional committees on petroleum, Sen. Abel Oceguera Alvarez, chairman of the former, and Congressman Victor Alfonso Maldonado, head of the latter, after an interview with Efrain Buenrostro, Pemex's managing director.

One of these pipelines will extend from the Ebano field of the Gulf Coast to San Luis Potosi City, capital of the State of San Luis Potosi. The other will traverse a course from the San Benito field, southern Vera Cruz to Tapachula, Chiapas, on the Guatemalan border. Company engineers are now drafting plans and costs of the jobs. Reports are that the two lines will cost together eight to ten million pesos.

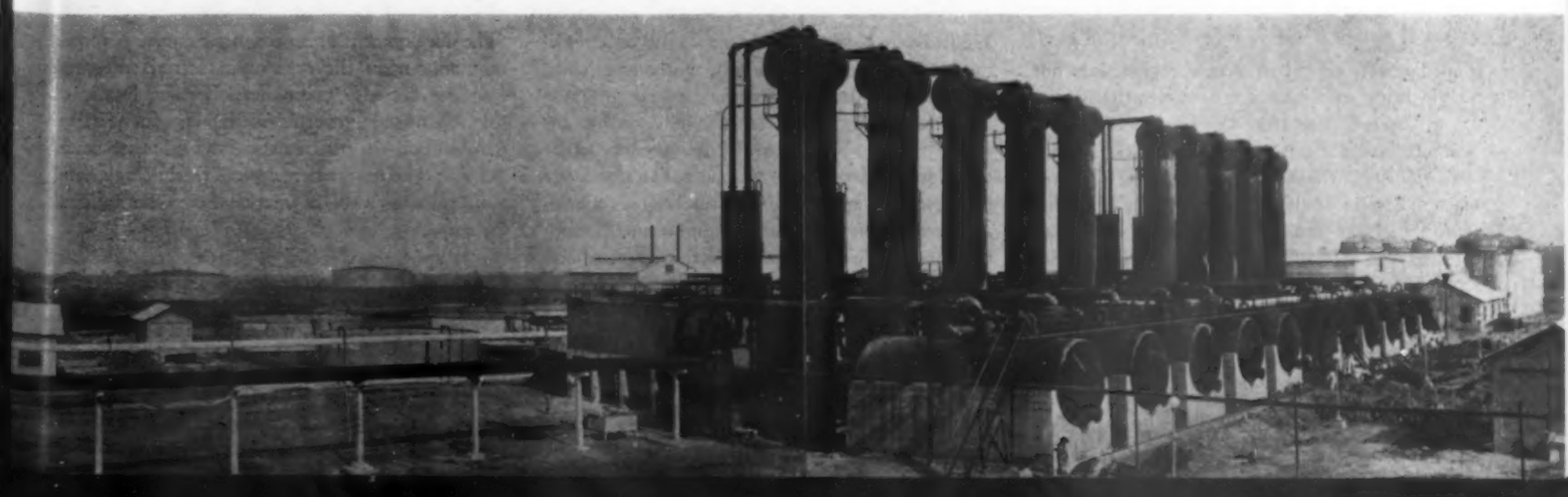
Construction of a third pipeline figures in the program by which Pemex hopes to assure first class distribution of its products now and in post-war within the country. This third line will be built by the National Railways in conjunction with Pemex, according to an announcement by Ing. Andres Ortiz, the railroad's general manager. This line will run from Tamasopo, in the Tampico zone, to Cardenas, important railway center in San Luis Potosi. Sr. Ortiz said that President Manuel Avila Camacho has approved plans for this line which, the official explained, will not only increase oil deliveries from the Gulf Coast in volume and speed but will be much more economical than rail transportation as much of the railway route in that region is of a 4.5 percent grade, which is a great strain on the railroad's motive power.

Railroad tank cars are to bring the oil to Tamasopo where it will be pumped to Cardenas. Another advantage of this pipeline, Sr. Ortiz said, is that it will release more rolling stock for general freight service, now much overburdened because of war conditions. Air surveys of the route have been made and construction is to start soon. Sr. Ortiz made no mention of the cost of the job, but it is reported that it will be about three million pesos.

In conjunction with the enlargement of the Aztcapotzalco refinery the pipeline connecting it with the Poza Rica field, built by Mexican Eagle a few years before expropriation, will be increased in capacity to move 35,000 barrels of crude oil daily.

Pemex is also giving attention to making more adequate its sea delivery services, for the home market and export. It has contracted with the Cia. Constructora Maritime, S. A., a Mexican shipbuilding firm, for the construction of twenty-two modern-type tankers. They will be concrete lined, will be of large capacity and high speed, capable of transporting petroleum products not only in Mexican coastwise service but to Central and South American ports as well. The company expects to take delivery of the first of these tankers either late this year or early in 1945.

From time to time reports appear in the foreign press that negotiations are under way with British and Dutch interests by which El Aguila or a new company formed to replace it will resume operations in Mexico. Since the Mexican government has settled the questions that arose between it and the United States over expropriation it, undoubtedly, would be glad to clear up this still outstanding issue. In Mexico, however, it is asserted that no settlement will be made that includes the restoration of oil properties to their former owners. It is pointed out that under federal law the oil business, so far as exploration is concerned, must remain in Mexican hands and that only Mexicans can engage in that branch of the industry. The law was enacted to back up the constitutional provision that oil subsoil rights belong to the Mexican nation. It is possible, however, that foreign capital might be permitted to engage in other phases of the business.



OIL DEVELOPMENT IN THE AMERICAS

By Joseph E. Pogue
Vice President, Chase National Bank

FOR MORE than fifty years the twenty-one American Republics have been engaged in a great cooperative enterprise along political lines and many advances have been made. More recently, and particularly during the war, our collective interest has broadened into the field of economic problems, and after the war these may be in the forefront of our intercontinental efforts. With this development in prospect, our common interests in oil will become of special significance and, if we wish it, our position in the world of oil can make a great contribution to the growing importance of the Americas.

Six years ago I stood in a narrow valley of the Andes, inspecting the construction of a modern road to service the installation of an oil pipe line across the mountain barrier. A hundred yards away was a narrow trail which for centuries had served as the only means of communication with the outside world. Along that trail came a pack-train of burros laden with coffee, plodding its tortuous course amid the clang and screech of the steam shovel, the caterpillar tractor and the truck. Here in fast motion was evolution from human and animal labor to the use of mechanical energy. The next day an airplane carried me in three hours over an expanse of jungle and mountain that twenty-five years before had taken me fourteen days to cover. I had seen the conquest of both time and space. The cause of this great revolution was oil.

Oil is thus more than a useful substance. In action it becomes a leaven, a supercharger, an economic multiplier, a social catalyst. Important as it is as a source of light, heat, mechanical energy, lubrication, and a host of chemical products, its production and utilization arouse other activities and set going a chain of economic developments. Because of these generating qualities, oil constitutes a great force for social and economic progress. This characteristic is enhanced by its liquid form, which provides such mobility and divisibility as to carry its use directly to the individual, spreading its benefits throughout all classes of society. Oil is particularly potent in the field of modern transportation, which it has raised to a higher power, projected into a third dimension, and freed from former limitations in time and space.

The discovery of oil in a new region does not merely bring into existence new wealth; it stirs up collateral activities in ever-winding circles. It becomes a dynamic force which stimulates industry, trade, and agriculture. It thus reaches beyond itself and serves as a lever for raising the standards of living. Oil should accordingly be a favored instrument for the social architect.

There are twenty-one sovereign states in the Western Hemisphere. Each differs from the other in size, population, natural resources, industry and trade. Their relative positions in the world of oil run a wide gamut. Two of them, the United States and Venezuela, produce oil on a grand scale, ranking first and third in the entire world; together they are responsible for the output of 93 per cent of the Western Hemisphere's oil. Venezuela is the largest exporter of oil in the world. Four other of these countries—Mexico, Argentina, Columbia, and Peru—are substantial oil producers, but together they do not quite attain five percent of the total oil output of the Americas. Ecuador, Bolivia, and Brazil also produce oil, but thus far in small quantities. Some countries in the Western Hemisphere with important oil potentialities have no commercial oil production at all.

Standards of living vary widely among the states of the Western Hemisphere. These variations bear a direct relationship to the consumption of oil. In South America before the war the annual per capita use of oil was 28 gallons; in North America this figure was ten times as great, or 282 gallons. The United States headed the list with 367 gallons—both an effect and a cause of the country's high degree of industrialization.

The relative differences in oil developments among the countries of the Western Hemisphere are not wholly explainable on the basis of the irregular occurrence of the resource. True, oil is not evenly distributed throughout the continents but tends to have its more prominent manifestations in the great sedimentary basins, of which the Caribbean area is a good example. Yet most of the countries of the Western Hemisphere have geologic conditions favorable to the occurrence of oil on a far wider scale than now known. Careful studies of the basin areas suggest that future oil discoveries in the Americas will be a multiple of those uncovered to date, with the aggregate expectations even greater in Latin America than in the United States. Oil, in a sense, is where you look for it and the pattern of production is influenced in many cases more by the attitude or activities of the state than by the prospects offered by nature.

Undiscovered oil is an asset to no one. Oil must be located by prolonged, costly and laborous effort, guided by scientific methods of great complexity. Once discovered, it must be brought to the surface, refined, and distributed by other techniques scarcely less specialized. The body of petroleum technology has undergone continuous expansion and radical improvement, with the most remarkable and effective results, and the war has accelerated this progress. No less significant have been the advances in government-industry relationships and methods of administration, especially those embodied in the conservation system of oil production evolved in the United States. While the sources of oil are restricted by nature, the availability of oil is subject to almost indefinite extension under the impact of dynamic techniques. The United States would have run out of oil repeatedly, had its technology remained static or become frozen. A type of economy that maximizes technological progress is bound to be the most favorable medium for development. Nature unaided does not give birth to oil in commercial form.

Oil is derivable not only from petroleum deposits, which must be continuously replaced by unremitting search and the multiplying influence of technologic conservation; it is obtainable also from many other raw materials such as natural gas, coal, oil-shales, and tar-sands, although more laboriously and at higher costs. These secondary reserves become effective only at later stages in the economic life-cycle of oil, after the more available resources become exhausted, but their development may be accelerated by nationalistic trends and trade barriers. The natural petroleum and other hydrocarbon resources of the United States are so vast, running into the equivalent of thousands of years' supply, that this country could be kept self-contained in oil for an indefinite period, were a policy of isolation adopted. To hold to such an objective, however, would entail such insulation from foreign sources of supply as to lower the effectiveness of our economy. By the same token, the economies of the Latin American states would be worsened, for the free interchange of the complementary supplies of the two hemispheres would be hampered. It would be more advantageous to all concerned to invoke the great principle of the international division of labor and promote oil developments throughout the hemisphere with resultant expansion in international trade. This, has long been the unplanned policy of the American oil companies, for the nationals of the United States have carried on oil developments in all parts of the world where private enterprise is permitted to operate.

The development of an economic domain depends not only upon the type of industrial enterprise engaged but also upon the policies and laws of the particular government having jurisdiction. In addition the policies and laws of other states have a bearing; since capital, technology, and enterprise as well as markets are international in scope.

The principal aspect of the oil policy of the

United States has been the assignment of the field to private enterprise, with the federal government limiting its intervention to anti-trust laws, moderate import tariff charges, support of conservation measures, and diplomatic aid in varying degree to its nationals engaged in foreign oil developments. An important adjunct to a policy favorable to individual enterprise is the system of land tenure under which the subsoil mineral rights are owned by innumerable individuals and the mineral rights in the residual area of public lands are with some exceptions leased for private development. This circumstance has proved important not only in facilitating oil discovery but also in spreading the revenues from lease bonuses, rentals, and royalties among hundreds of thousands of individuals, many of them in the lowest income brackets. In addition most of the tax receipts from oil are decentralized, going to the states which devote them in the main to the development of the country through expenditures on highways and educational institutions. It has thus come about that no state has felt that its resources were used without adequate local benefits, even though in many cases, illustrated particularly by Texas, most of the oil produced was shipped to other states for consumption. The unparalleled development of the oil industry in the United States derived part of its impetus from these policies which at the same time helped diffuse the economic benefits to all classes.

The rapid development of oil in the United States was bound to focus attention upon the public interest in waste-prevention, and the industry and the state have long collaborated in perfecting methods of conservation which during the past fifteen years have had the effect of revolutionizing oil-field practices. From experience gained in curbing overproduction, particularly in the late 20's and early 30's, it was found that oil wells yield more oil by natural flow and give up a greater ultimate recovery if throttled down to the so-called optimum rate, which permits the maximum utilization of the natural reservoir energy responsible for extracting the oil from its underground habitat. To implement this principle, the whole pattern of oil-field operations in the United States was altered from open-flow to regulated rates by a system of proration. The change is epitomized by the phrase, "No More Gushers," for oil wells are no longer permitted to produce at full capacity.

The means employed in bringing about orderly production are state conservation laws administered by state regulatory bodies; a coordination of efforts by means of a voluntary association of the states in the form of an Interstate Oil Compact Commission which operates without powers of enforcement but with the sanction of the federal government; and a production program guided by purely advisory quotas computed by technologists in the Department of Interior. By virtue of its decentralized form and consultative aspects, open hearings in advance of action, and constant review by the courts of the orders of the state conservation commissions, this system has been successful in raising operating efficiency without impairing the forces of initiative, individual enterprise, and competition, so indispensable for oil discovery and the promotion of technological progress.

Through the multiplying effect of dynamic technology and conservation measures, the oil industry has continuously expanded the recoverable oil reserves of the United States, despite the production of 28 billion barrels since the first well was completed in 1859. At the close of World War I there were 7 billion barrels in the underground reserves; today, after an intervening withdrawal of 24 billion barrels, the proven reserve is 20 billion barrels. The oil reserve is not a fixed quantity unless the processes of development are arrested. At any given moment its size is subject to measurement in more or less specific terms; but as time proceeds, more oil is discovered by existing techniques, new methods of discovery are devised, the areas of search are extended both regionally and vertically, the efficiency of recovery is raised, the effectiveness of processing and utilization is improved, and entirely new resources are created by chemical science through its ability to rearrange molecular structures. The effect of this progression on the state of the art is to multiply the resource and extend its frontiers. Conservation procedures, in turn, make possible the fuller application of the fruits of technology, conserving the benefits against the inroads of waste and intemperate development. These instrumentalities should go far foward allaying the fear that oil development must be a wasteful episode, short-lived and leaving deflation in its wake, for the means of stabilization are available for wider application.

The organization of the oil industry in the United States and the methods governing its operations resulted in the discovery, production and use of oil on the greatest scale that has been witnessed in any part of the world. The industry has been responsible for technological advances and mechanical improvements unequaled elsewhere and has established principles of operation which can be applied with advantage by other countries seeking to develop their own petroleum resources most effectively for their own national well being.

The governmental policies applied to oil in the Western Hemisphere fall into three categories: those favoring operations by private capital with specified legal restraints; those supporting mixed operations by private and state enterprise, and those having arrangements under which the state alone conducts the business. The record leaves no doubt that oil is found and developed more abundantly and efficiently by private enterprise than by mixed enterprise or state monopoly.

This is the second war in which the two Americas have combined against a common enemy. The last war transformed the economy of the United States in the direction of a more elaborate and structuralized use of technology, which gave great impetus to industrial expansion. World War I established automotive transportation as a powerful economic force which has altered the whole pattern of its life and even the map of the country. Oil has played a dominant role in this change. Not only does the large rise in oil production and consumption between the two wars constitute a gauge of industrial and social improvement, but oil itself was a cause and catalyst of other lines of expansion. This war is contributing still greater momentum to the industrial processes and is spreading a new form of transportation in the air, commanding a third dimension in space.

Latin America is predominantly an area of agricultural resources and this feature has established the basic pattern of its economy. World War I greatly stimulated the agricultural development of this great area, but the war did not last long enough to advance the industrial aspects of the countries to any significant degree. The problem of the postwar accordingly was the necessary adjustment to the vastly increased agricultural capacities created by the stimulus of war conditions. In this world conflict, however, the cessation of shipments of goods from Europe and the heavy drain upon the resources of the United States have focussed every effort upon building up the industrial capacity of these countries. Accordingly the problem posed for this postwar period is how best to sustain this accelerated industrial trend, in order to gain the social and economic advantages of expanding and more diversified economies.

Hitherto oil in Latin America has been an incident, and unlike the case in the United States, it has exerted only a limited and localized effect upon those countries and their peoples. Its possibilities there have thus far been largely unrealized.

Yet oil is made to order for Latin America. Its undiscovered oil resources are undoubtedly great. With its great mountain barriers and vast jungles, its topography is unsuited to railway developments on a grand scale, but the separate centers of activity are easily interconnected by the airplane and the motor car. More than this, the lack of communication has led to a very spotty development of the resources of Latin America. Oil can immeasurably benefit the peoples of Latin America if its discovery and use can be facilitated.

Oil developments within a state improve the internal economy in many ways. The direct benefits come from the moneys spent locally by the enterprises engaged. These funds go to the government in the form of royalties and taxes and to the workers in the form of wages and social services. Amounting generally to about

40 cents a barrel, these funds, in turn, represent purchasing power which generates a widening circle of commercial operations. There are also capital expenditures for camps, houses, pipe lines, roads, hospitals, and schools which remain in the country. In the United States in recent years the capital expenditures required to replace each barrel of oil produced have averaged 44 cents. In general between a half to two-thirds of the value of the oil produced remains in the country of origin in the form of operating and capital expenditures. Such expenditures alone result in a larger local oil consumption. The special significance of oil consumption is that it multiplies human energy by improving transportation, foreshortening the cycle of production and distribution and enlarging the scope of industry and agriculture. In the United States the use of gasoline creates the energy equivalent of 39 mechanical slaves for each individual of the population.

Important as it is as a catalyst in the internal economy, oil in addition is an ideal commodity for generating foreign trade. It is a substance in universal demand whose use promises rapid growth throughout the world; unlike agricultural commodities its demand has no saturation point; it is less affected by the trade cycle than almost any other commodity, and in a proper economic setting it has considerable price stability. Exports of oil pay for imports of other essentials of a higher living standard. In fact oil is "liquid gold" and in effect can serve the same role as gold in settling international balances. The production of gold in a country provides a commodity that *ipso facto* meets deficits in the balance of international payments. The economies of South Africa, Canada, and Australia have long benefited in this manner. Similarly, the countries of Latin America can augment their foreign exchange and vastly expand their international trade by creating exportable surpluses of oil.

Venezuela has gained substantial advantage from her position as the largest oil-exporting nation in the world, although that country has not fully found a way to spread its benefits to all of her people. For many years prior to the disturbed conditions of the war, oil represented 80 to 90 percent of the country's total exports, provided the foreign exchange to cover the cost of all imports, and contributed one-third of the government's total revenue. In Peru, oil exports represent about 30 percent of the country's export trade; while without petroleum, Columbia would be forced to curtail her imports. Some fifteen years ago, Mexico was the world's largest exporter of oil and its oil was an important factor in the last war, but Mexico's foreign trade in oil has dwindled in recent years.

Oil developments in Latin America can also serve its states creditwise and indirectly benefit the industrial progress of the entire area. The interval between the two wars was marked by two contrasting periods. In the first decade there were large extensions of credits by foreign capital, but as most of the countries excepting Argentina suffered from chronic deficiencies in their balances of international payments, the debts incurred could not be serviced. In consequence the sources of foreign capital dried up and the second decade was characterized by little foreign lending. Debt service is frequently a major part of the balance of payments between countries engaged in commercial intercourse. No activity can be more conducive to maintaining the credit-worthiness of a country in need of capital than oil operations on a sufficient scale to create a surplus for export. The potential oil reserves of the Latin-American countries can be converted by economic processes into the basis for the inflow of capital funds along a broad front, thus augmenting the output of goods, facilitating their freer exchange in international trade, and contributing an additional base for improved living standards.

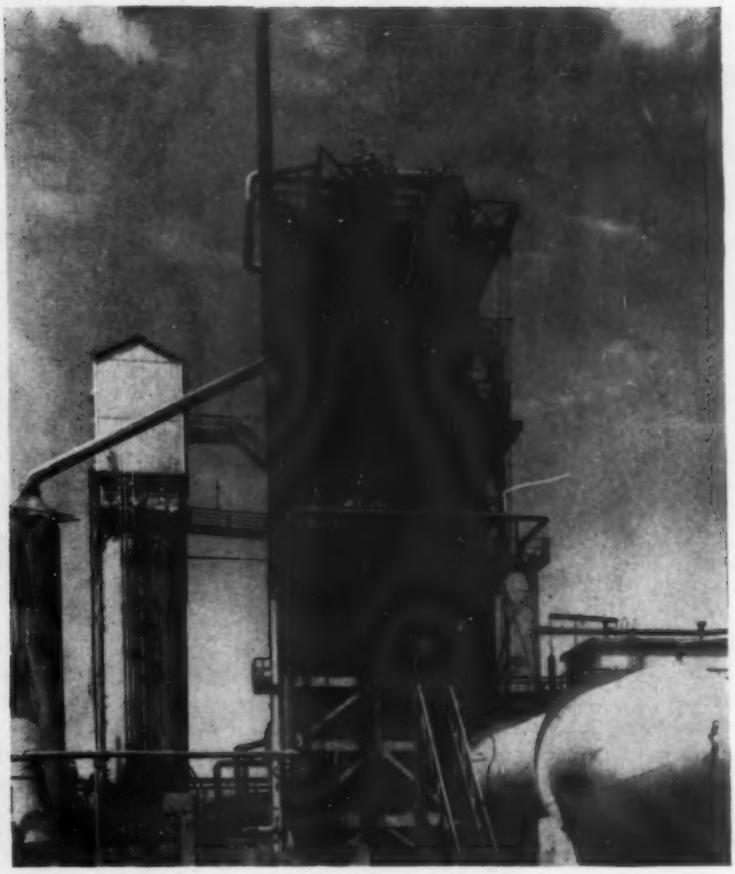
What has been responsible for the unequal and lagging development of oil resources in most of the countries of the Western Hemisphere? Capital and management have been available, for international oil companies have apparently been ready and even eager to extend their operations. Yet many of these countries have pursued policies of state intervention or control that suggest a lack of confidence in the benefits to be derived from foreign capital and foreign enterprise in the field of oil. And the countries which directly or indirectly have discouraged outside capital have not apparently developed adequate substitutes in their own efforts. The basic cause of this economic impasse, it may be surmised, is a psychological factor: the fear that oil will be developed and its values dissipated in a hasty and wasteful manner with inadequate local benefits; in short, that the countries will be exploited. This feeling is easily understood on the part of a people sensitive to history, for this is exactly what happened in the early days in the case of gold and silver, when the spoils of conquest filled the galleons bound for Europe. Nor were elements of exploitation absent in the early days of agriculture and mining in the Americas. If one could give satisfactory testimony that these fears, despite the experience of a past era, are now groundless in the modern setting of technological progress and social consciousness which animates enlightened industry and governments, he would provide the key for unlocking a great potential for the welfare of the Americas.

The principles of conservation as developed and applied in the United States provide safeguards against exploitation. These principles, however, require mutual understanding and cooperation between industry and the state, for each must contribute appropriate elements to the whole. Conservation with technology is a unique thing whereby "to him that hath, more shall be given". The oil industry has perfected techniques which, with the aid of the state, prolong the life of existing fields and constitute the means for preventing the denuding of a great resource. But the state itself must contribute to this end by the provision of sound conservation laws efficiently administered, and by participation in a system of world collaboration. In addition the state must create political stability and thereby reduce the political risks, because conservation practices require the use of far more capital per unit of current production than does a process of rapid withdrawals. The responsibility is accordingly one which must be shared.

In addition to a desire to assure itself of prolonged and stable oil operations, a state will naturally seek other objectives essential to a balanced economy. The most important of these are three in number: first, how to get its oil resources discovered and developed with the maximum efficiency; second, how to assure the diffusion of the benefits of oil development among the greatest number of its people; and third, how to gain through oil the maximum advantage in the way of foreign trade.

It has already been intimated that oil has characteristics which render it peculiarly unadapted to development by the state. Experience likewise indicates that competitive private enterprise, which has the "know-how", finds more oil and creates more active expansion than centralized effort. The records of experience, however, do not reveal the full contrast, for individual enterprise creates technology whereas the state must operate on borrowed technology; accordingly the efficiency of state operations is apt to decline as the setting conducive to continuous technologic progress is lacking. There are no examples of outstanding contributions to petroleum technology by state enterprise.

The advantages of private enterprise in oil operations are also clear on other grounds. Assuming naturally a structure of vertical integration, the oil industry is an assembly-line type of procedure in which the successive stages of exploration, production, transportation, refining and distribution are linked into a continuous process. Accordingly if electing to enter one branch, the state cannot avoid being drawn directly into others; in this way it becomes involved in operations extending across political boundaries, with inevitable international complications which private enterprise can avoid, having no sovereign status and being international in scope. In many countries, also, the state lacks the necessary capital, which would have to be borrowed; great difficulties would be thus entailed as credits cannot properly be extended for oil developments in their early speculative phases. The field requires venture capital applied on the principle of diversification of risks, which no localized effort can accomplish but is a normal function of operation in many countries. Furthermore, powerful governments cannot make investments within the jurisdiction of other states without invading their sovereignties, nor



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GASOLINE POWERS THE ATTACK — DON'T WASTE A DROP

extend credits to them for new and unproven developments without creating risks of discord and disturbed relationships. Above all, the great principle of the international division of labor is best promoted by private enterprise. The prospects for a freer flow of capital and goods from country to country would be immeasurably lessened if nationalistic trends in oil continue.

While the records of profits derived from international oil operations are not publicly available, there is much evidence to show that the results are not out of keeping with the risks involved and are on the modest side. A detailed computation of the rate return on invested capital of 30 representative oil companies for the ten years, 1934-1943, shows an average of 6.6 percent. Of this group, the five companies of greatest importance in international oil operations enjoyed a rate of return of 6.7 percent, against 6.4 percent for the twenty-five others. A private communication from a successful and efficient private oil company operating in South America states that its rate of return on invested capital for the past ten years averaged 10.7 percent. In 1940, according to the United States Department of Commerce, the total investment of the United States oil companies in foreign oil operations was 1,277 million dollars, and the aggregate net income from these operations was 105 million dollars, indicating a rate of return of 8.2 percent. It is difficult to find evidence of exorbitant profits made in foreign oil operations. There is doubt if they exist.

More volume of production does not necessarily bring its full complement of advantage to the producing area, even though the state derives its proper share in the form of taxes and royalties. Much depends upon the disposition of these proceeds. In the United States the royalties go directly to the people, usually farmers, and are automatically disseminated within the low income groups; while the proceeds from oil taxes are devoted largely to the construction of highways whose use creates still larger oil consumption. Accordingly oil has promoted the development of this country in a very direct manner. In Latin America, however, the system of land tenture is usually such that the royalties from oil production go directly to the state and therefore must be conciously devoted to special purposes if their effects are to be multiplied and spread among the people. They are not necessarily expended with this purpose in mind. A state, however, can offset the centralizing effect of its special position as direct recipient of royalty funds by deliberately devoting the bulk of its oil revenues to the building of roads, hospitals, schools and to the promotion of other measures for the upbuilding of the country. A state must meet this need if it desires to maximize the advantages derivable from oil developments.

The level of the taxes and royalties imposed upon the operator by the state is always a difficult subject for mutual agreement, but the proper division of values must be within the fairly narrow margin between total industry costs, including amortization and return on investment, and the price the oil will command in world markets. If total costs are raised above competitive levels, sales in the world market are prevented and development is arrested.

Where oil is producible in excess of domestic requirements, it is advantageous to enter world markets for the disposal of the surplus. Under these circumstances, a state finds its own oil policy in contact with the oil policies of all other countries. As the only way to avoid international trade in oil is for each country to match its needs with its own production, or else limit its output to its own requirements, it is readily seen that such a closed system would be harmful to both producing and consuming countries. It follows that no single country, if it be importer or exporter, can detach its oil economy from the rest of the world. This is why oil is an international problem and why the oil policies of the various countries need to be coordinated into a balanced system in order to bring about the efficient use of the world's oil resources and make possible the employment of the most advanced conservation methods. So we are confronted with the need for each state to develop a sound policy in respect to its own oil and then collaborate with all other states in the development of a world oil policy to the end that oil may be the great constructive economic force appropriate to its potentialities instead of the basis of strife and discord. An oil war need not follow this war, but it will call for statesmanship to make certain. A renaissance in economic progress can follow this war, but that too will require knowledge and good will.

The evolution of an oil policy is under way in the United States. The petroleum industry has displayed initiative and leadership in formulating the outline of such a policy in the form of recommendations to our government. The Foreign Operations Committee and the Petroleum Industry War Council, both of which are industrial advisory groups with an official status, have recently submitted to the Petroleum Administration for War reports entitled, "A Foreign Oil Policy for the United States" and "A National Oil Policy for the United States", both of which have been made public. These reports present what the industry believes to be a constructive approach to oil both here and abroad, and are marked by a world point of view and an interest in the welfare not only of the peoples of this nation but of all other countries as well. The recommendations make a strong case for free private enterprise, disfavor the entry of the United States government into the oil business, endorse the conservation system in use in the United States, favor the open-door policy and equality of opportunity in foreign oil operations, and urge the diplomatic support of the country's nationals to these ends.

The report on foreign oil policy goes further than the formulation of principles and includes a design for an International Oil Compact, open to adherence by all oil-producing and oil-consuming states and patterned after the Interstate Oil Compact long in successful operation in the United States. The purposes of the Compact would be to insure the efficient production and orderly distribution of oil, to coordinate the oil policies of the various countries, and to expedite the settlement of disagreements and disputes. The means to these ends would be provided by a General Conference, a Permanent Commission, a Technical Institute, and Regional Councils. The Compact would be purely advisory, it would have no powers of compulsion, it would provide for consultation and collaboration, and it would bring the member states and operating units into contact for mutual discussion and understanding. This proposal is still pending and many believe that such an international instrument will go far toward insuring the same orderly, efficient, and vigorous development of the world's oil resources that have characterized petroleum progress in the United States.

These reports have aided in bringing the government of the United States to a more active realization of the importance of oil, which resulted in the calling of an Anglo-American Oil Conference. The result is a bilateral agreement to further the principles of orderly oil production and distribution which, it is hoped, will constitute an initial step toward a later multilateral agreement in which all nations will be invited to participate. A joint oil commission will be set up to analyze supply and demand from a world standpoint and recommend balanced programs; such a commission to be purely advisory without powers of enforcement. This proposed bilateral action is of special interest as registering a stage in the evolution of a world oil policy in which all countries will have an interest and should participate. Oil is a world commodity and must receive world treatment.

Oil offers a contribution of growing importance to the Americas, granted a satisfactory working arrangement between the countries with the resources and markets, and the corporate units and individuals possessing the requisite capital, organization and technology. There is a strategy of progress and this is its key. The oil industry functions best if these characteristics are recognized: integration makes it international; venture capital makes it private; technology makes it competitive; and search makes it individualistic. Governments function best in respect to oil if the following procedures are favored: to get oil discovered and developed, use private enterprise; to make oil last, employ modern conservation measures; to diffuse the benefits of oil throughout the population, apply government revenues from oil to the construction of roads, hospitals, and schools; to gain the maximum benefits from foreign trade in oil, engage in international collaboration.

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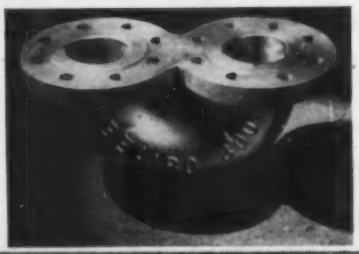

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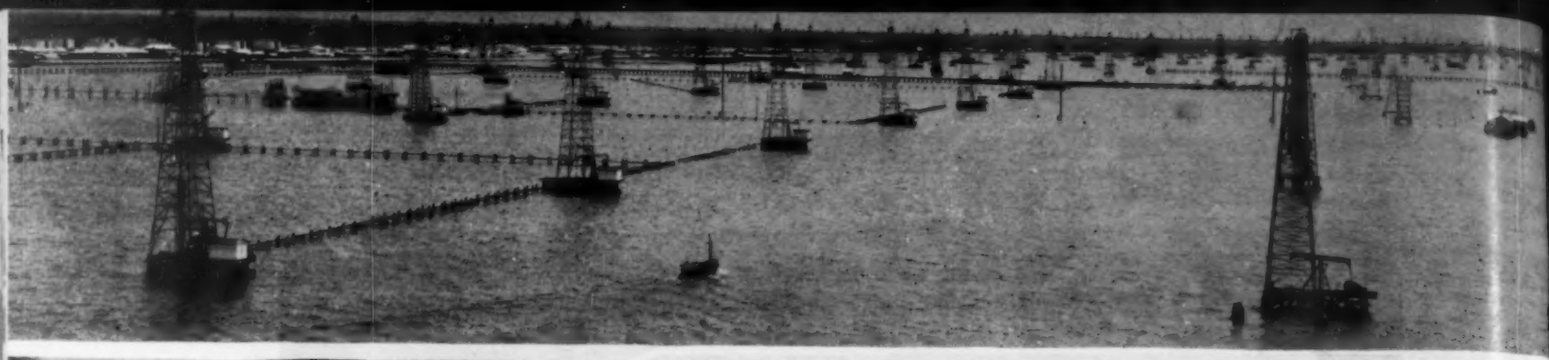
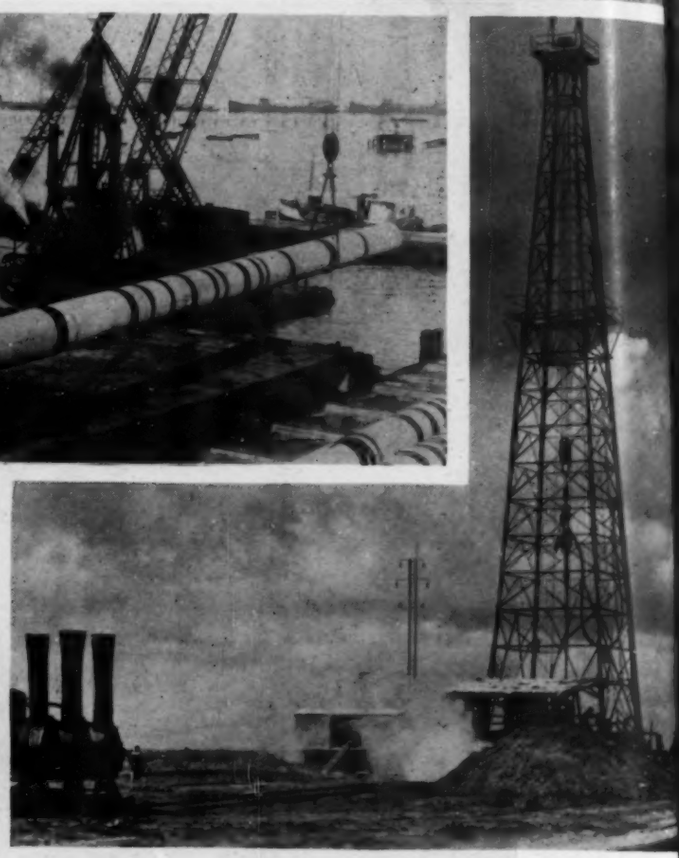
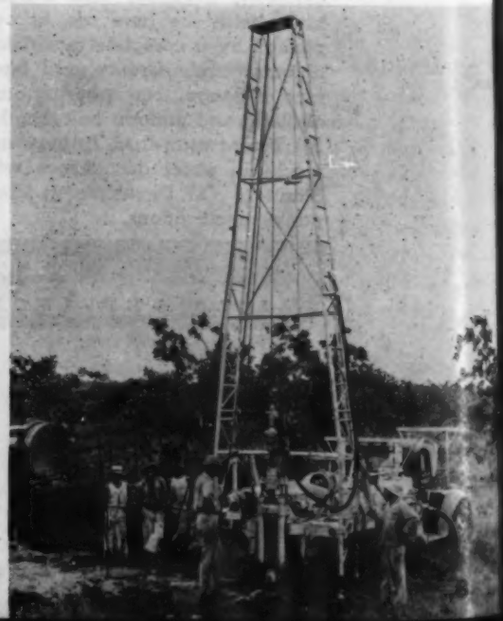




Typical Scenes from Venezeuelan Oil Development Showing the Lagunillas Field in Maracaibo District, Casing Prepared for Lake Drilling, a Well Being Cleaned in the Eastern Area, Drilling in Jusepin Field, Labor Camp at Caripito, Distributing Pipe for Mulata-Pto La Cruz Line, Gathering Station at San Joaquin and Seismic Party with Failing Portable Drill near Jusepin. Photos Courtesy Standard Oil Co. (N.J.)



Activities in Venezuelan Oil

By Antonio Reyes

IN recent months there has been unusual activity in Venezuelan oil affairs. New explorations and new drillings are continually being started. Some of the latest developments along these lines may be mentioned.

During the period between May 15 and July 15 of this year the Creole Petroleum Company has finished preliminary work in the following localities: Mulata field—11 wells; San Joaquin —3 wells; Jusepin—13 wells; Lag millas—5 wells; Tia Juana—3 wells. In the same period the Mene Grande Oil Company has prepared the following extension program: Oficina field —9 wells; Guara—8 wells; Santa Barbara—5 wells; and Yopales—2 wells. Venezuela Oil Concessions has a program of five wells for the La Paz field. For its part the Compania Consolidada de Petroleo has announced seven wells for the Muri field and one for Santa Barbara. New wells of the Caribbean Petroleum Company include three for the Mene Grande and three for Tarra fields. The Sociedad Anonima Petrolera "Las Mercedes" has completed one well in the Las Mercedes field. Also, the Socony-Vacuum Oil Company is continuing drilling operations in the Guico field, where to date one exploratory well has been completed and two others will soon be started.

The Texas Petroleum Company is also intensively prosecuting exploratory work, distributed as follows: Las Mercedes, Seisdel No. 2, Rincon Largo, Delta, and Los Caritos. All this adds up to an appreciable increase in the exploration and development of the country's oil resources.

The program for future activity points to a continuation of the expansionist movement. The authorizations which the national government has accorded to the oil companies for future exploration indicate further developments of far reaching importance.

As an indication of present and future developments the following details may be listed: The Creole Petroleum Corporation has under construction six depots, each with a storage capacity of 750 cubic meters, and three Gaso pumps at the La Mulata gathering station. The same company has also obtained a right of way to a tract of 93 hectares in the municipality of Punceres in the District of Bolivar, State of Monagas, which will facilitate the exploitation of concessions located within the surrounding territory. The Creole Corporation has obtained two other rights of way for the same purpose in the municipality of Cantaura, District of Freites, State of Anzoategui.

Enlarged storage facilities for aviation gasoline and Diesel oil have been provided at the refinery of La Arriaga, together with two 4-inch, 900-meter pipe lines for transporting the aviation gasoline. Also worthy of mention is the construction of another 6-inch line which runs from La Mulata to the Santa Barbara storage depot of the Compania Consolidada de Petroleo, and the construction of six depots, with a total capacity of 5,520 cubic meters, which will be erected on leased ground along the road from La Trinidad to the east of Ciudad Bolivar.

There are also being constructed in Caripito various depots with a storage capacity of 15,889 cubic meters of Diesel oil.

As regards the activities of the Venezuela Oil Concessions, it may be briefly mentioned that this company has acquired rights of way in the municipality of Ricuarte, District of Mara, and in the municipality of Lagunillas, District of Bolivar, both in the State of Zulia, which will give this company appreciable facilities for prosecuting its enterprises in these regions. For the amplification of its operations Mene Grande Oil Company has also obtained similar rights in the municipality of Cantaura, District of Freites, State of Anzoategui. Concerning the Caribbean Petroleum Company, it may be mentioned that it has obtained rights of way in the municipality of San Rafael, District of Mara, State of Zulia, and will soon build 16,384 cubic meters of storage capacity for Diesel oil in Barquisimeto, capital of the State of Lara. The Compania Consolidada has rights of way in the municipality of Caicara, District of Cedeno, State of Monagas, and in the municipalities of Santa Barbara and San Simon in the same District. Other operating improvements of this company include enlargement of pumping facilities on the company's pipe line which runs from Santa Barbara to the terminal at El Chauro in the District of Maturin, State of Monagas. Also included in the improvements of this company is the addition of two depots, with capacities of 12,764 cubic meters each, to its storage facilities in the District of Maturin, State of Monagas.

Continuing this inventory of the development of the petroleum industry in this country we find that the Colon Development Company has obtained permission to take water from the Rio Catatumbo for use in the exploitation of its concessions in El Rosario, municipality of Encontrados, State of Zulia. The Socony-Vacuum Oil Company has requested the adjudication of more than 300,000 hectares of oil lands in the Bolivar and Santa Barbara municipalities, District of Pedraza, State of Barinas. It is also known that the Venezuela Atlantic Refining Company has solicited concessions in these zones, but details of the proposition made by this company have not been given out. Also, the Caracas Petroleum Company has solicited concessions in the State of Guarico which include an area of 17,950 hectares.

Among other indications of the activities that pervade the Venezuelan oil industry and give a hint on prospects of the near future, is the recent arrival at various Venezuelan ports of large amounts of materials, particularly at the port of Guanta in the east of the Republic. This material is consigned to the Compania Consolidada de Petroleo, which plans to enlarge the capacity of its Santa Barbara—Puerto de la Cruz pipeline from 50,000 to 65,000 bbl. daily. In the meantime it still has not been announced where the Creole Company intends to install its big new refinery on Venezuelan territory. It is supposed that the company is delaying the announcement until it has finished studies on the available supply of petroleum in connection with the port and pipe line facilities.

Quite lately, the Creole Company has come out with an appreciation of the great significance of the Jusepin field, which is characterized as by far the most important in that region. This appreciation is contained in a statement issued by C. H. Lieb, president of the Creole Company. It appears that Creole is enjoying a great increase in business to judge its most recent report covering the past four months, during which its earnings have exceeded those obtained by the old Creole and the Lago Petroleum Corporation during the same period of 1943; in that year the profits were $11,600,000.

Another appreciable evidence of the developments which are taking place in the Venezuelan oil industry may be seen in the production of 80, 87, 90 and 91-octane aviation gasoline for consumption by commercial aviation enterprises which operate in the country, and for supplying the military equipment of the national army. This aviation gasoline is produced in the plants of the Caribbean Petroleum Company in San Lorenzo, State of Zulia.

Another evidence of increased activity in the oil industry is that daily production in May 1944, has shown an increase of 50,000 bbl. as compared with April production of the same year. The daily production now exceeds the average daily production in 1943 by 160,000.

To conclude, reference may be made to the imminent completion of the gigantic task of building the pipe line and highway constructed by the Creole Petroleum Corporation and the Mene Grande Company between Mulata, State of Monagas and Puerto de la Cruz. This pipeline has a length of 109 kilometers, 65 of which are over flat country and 44 over broken country. The roadway, which is rated first class, has an asphalt surface 8.15 meters wide (wider at the bridges). This road is valued at 10,850,000 bolivars. The pipeline will carry 87,000 bbl. of oil a day to Puerto de la Cruz.

To sum up: the foregoing clearly demonstrates that the Venezuelan oil industry has taken a big spurt, which augurs a magnificent future for the many projects that are now being transformed into realities.

ELK HILLS DEVELOPMENT PROGRESSING RAPIDLY

ONE of the busiest spots on the oil map of the United States at the present time is the Elk Hills Naval Reserve in the San Joaquin Valley of California. Set aside for emergency use by the Navy during the Taft Administration the field had been carefully explored but its extensive development has been purposely delayed. Standard Oil Company of California acquired interests in this area in 1910 which were extended in 1926. Other property owners have smaller holdings within the limits of the Reserve which eventually will probably be acquired by the Navy. Standard's first producing well was brought in back in 1919 and in the years immediately following substantial production was built up but during the early years of the depression with its spectre of overproduction operations were reduced to a very small scale.

The present war provided the emergency which the Reserve was intended to meet but it was not until June 17 of this year that Congress finally ratified an agreement between the Navy and Standard of California for operation of the field under a unit plan although considerable development work had been done under an earlier contract that was set aside. The agreement now in effect contemplates an increase in daily production from 15,000 bbl. to 65,000 bbl. and involves the drilling of some 300 wells which is a formidable assignment even in these days.

The project was placed under the direction of Commander Harry Stolz of the Twelfth Naval District, and two committees were immediately appointed: An operating committee, consisting of Commander Stolz and Vic Wankowski, Standard of California engineer, and an engineering committee composed of three Navy representatives and three from Standard, of which these two are members.

Early on the property were three battalions of Seabees, under the direction of Commander Clive. They left for other duties on July 31, but before they did so had constructed about 50 miles of excellent road, had graded a hundred well locations, cleared off many tank sites, and had so advanced the preliminary stages of development that, according to the engineers, the project was pushed foward a good 60 days.

At the time of writing four wells have been completed and nine additional strings are in operation. It is contemplated, under the full scale program, that fifteen strings will be kept going in constant rotation, so that eventually one well will be completed every 24 hours until the required production has been achieved.

So far, wells drilled under contract, have been completed in from 12 to 21 days and have run true to form, producing in the neighborhood of 200 barrels each. Under the terms of the agreement Standard will continue to withdraw its 15,000 barrels a day but the Navy will get all of the additional 50,000 barrels, which will be sold at public auction and refined for the exclusive use of the armed forces — not a drop will be available for civilian consumption.

The entire project is being operated at cost, with no overhead, and the Navy is outspoken in its praise of the patriotic attitude, and general concessions that have been made by Standard Oil Company, whose facilities are being disposed so that the oil may be made available for the war effort in the shortest time at a minimum cost.

The Navy will strive by every means to keep as much oil as possible underground, and operations will practically cease as soon as it is clear that an emergency condition no longer exists. However, it is a factor in the agreement that Standard of California will be permitted to produce in such limited quantity as may be required to liquidate the actual and current expense of keeping the lease in a permanently operable condition, taking care of taxes and other such necessary expenditures.

Setting Engines Preparatory to Drilling in Elk Hills.

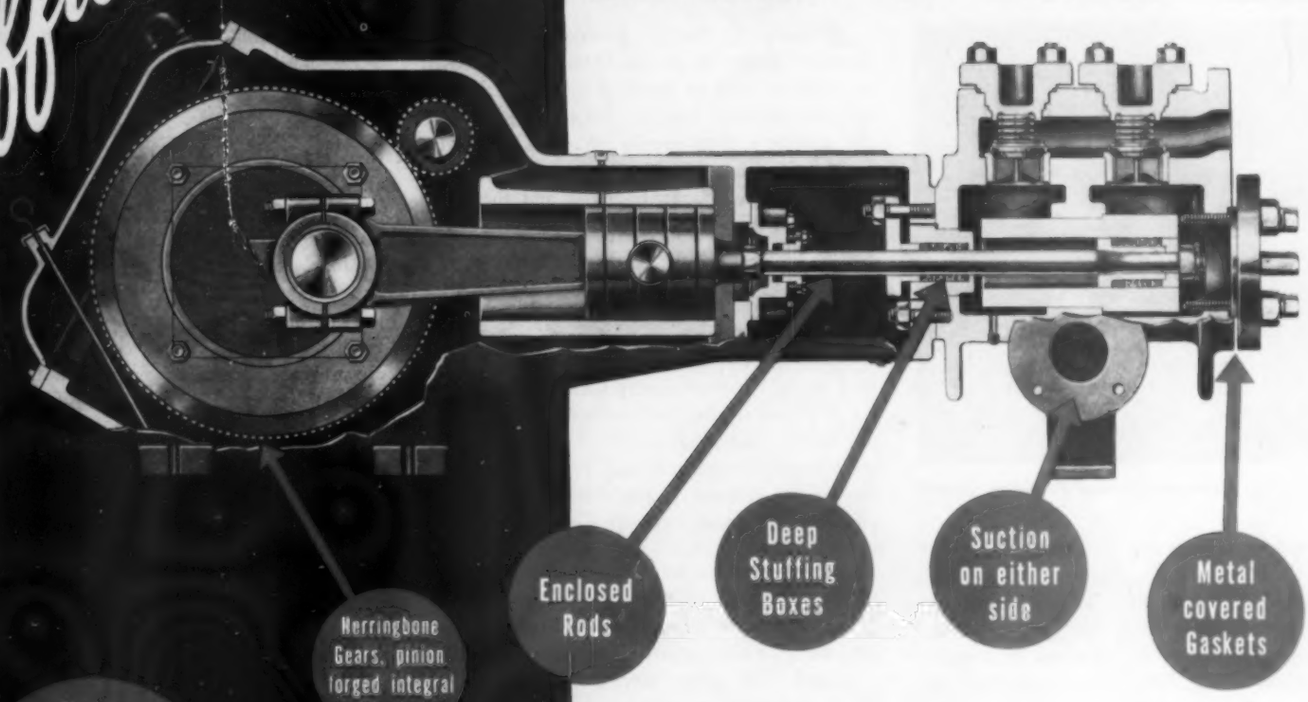
Well spacing has been fixed at one every ten surface acres, and one to every 20 sub-surface acres. Former production was gravitated to the Tupman pipeline station but production under the expanded operations will be taken into the Buena Vista tank farm for subsequent shipment to refineries. The shallow wells range around 3000 feet and the oil runs about 20° A. P. I. gravity. It is reputed to be of excellent quality for the manufacture of high octane gasoline and it has been stated that a straight-run gasoline from this crude rates somewhere about 70 octane number. The oil also provides fine base stock for the manufacture of certain highly desirable lubes. Conde from Stevens zone (from 5,000 to 9,000 feet) has a gravity of about 30° A. P. I. It may be mentioned also that the shallow zone structure shows extremely high permeability and porosity, so should give very little production trouble and should eventually lend itself very satisfactorily to secondary recovery exploration.

The Elk Hills field also contains a fairly promishing gas sand and has a good potential of dry gas which will be used for injection. Under former operations, available gas was piped to a small compressor plant capable of treating some 3,000,000 cubic feet of gas per day at 200 lbs., but with the projected increase, wet gas will be taken to Standard's Coles Levee plant which can handle approximately 10,000,000 cubic feet.

No story of Elk Hills would be complete without mention of the part played by Floyd S. Bryant, vice president of the Standard of California, whose efforts were largely responsible for the consummation of the agreement, and whose frankness and forthrightness in handling the negotiations made a decided hit with the Senate and House Naval Affairs Committees.

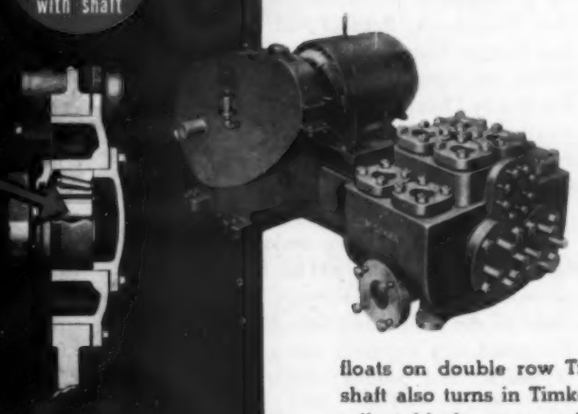
Looking at the present state of development in the field there seems to be little doubt that the much needed boost in production of 50,000 barrels a day will be realized. Commander Stolz is aided by a corps of practical engineers, geologists and operators who are showing under his direction that they know the business. This, with the fine cooperative spirit that prevails between Navy and Standard personnel, is assurance that anytime conditions warrant the operation of the Elk Hills, it will be done speedily, economically and harmoniously.

efficient McGOWAN PUMPS



Herringbone Gears, pinion forged integral with shaft

Timken Roller Bearings on pinion and crankshaft main bearings are easily adjustable as weight of gear and crank is in housing separate from adjustable cap



McGowan Power Pumps are heavy duty designs, engineered for dependable Oil Field Service. The power frame is heavily ribbed iron casting; the liquid end is made from very fine grained, controlled cast iron. Gears are continuous tooth herring bone, and pinion is forged integral with the shaft, which extends to both sides for connection to driver. Pinion shaft floats on double row Timken roller bearings while the crank shaft also turns in Timken roller bearings. Crank bearings are adjustable by means of shims, and this cap does not support the weight of the bearings, the crankshaft and gear, as these are supported in a separate housing, purposely made larger for easy insertion of these moving parts. Consequently this pump is easily dismantled.

The liquid piston rod can be removed from the back of the crosshead by removing piston rod cover and stuffing box in power frame.

The liquid end is a duplex side pot type with a suction on either side. The valve areas are ample and pot caps are sealed with metal covered gaskets, the same construction as used in cylinder heats. Liners are removable. Liquid ends of these models are available in commercial alloys depending upon requirements.

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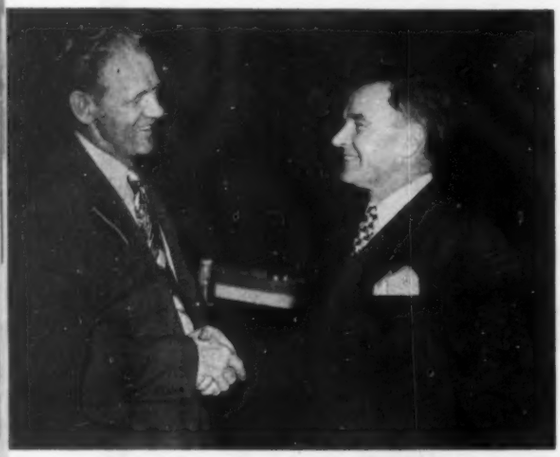


Ralph Clemons Welcomes Nomad President Smith.

GEORGE J. HANKS has been elected president of South Penn Oil Company to succeed the late Noel Robinson. Mr. Hanks joined the South Penn Company early this year. Previous to that time he had been connected for twenty-five years with the Tide Water Associated, being first employed by the pipe line subsidiary of the company. He served in various capacities in the production and transportation divisions of the company and in 1933 was transferred to the New York office in charge of eastern production, pipe line and tanker operations. In 1940 he was made director, vice president in charge of transportation and supplies, and vice chairman of the eastern division operating committee. He retained these positions until May 1944 when he resigned to join the South Penn organization. Mr. Hanks is well known throughout the oil industry in the eastern states as one of its most capable operating men.

ROLAND E. SMITH, president of the Los Angeles chapter of NOMADS, returned from an extended trip to South America at the end of July, arriving just in time to be present at the chapter's fifth annual Wing Ding. Mr. Smith's journey took him to Trinidad, eastern Venezuela, the Maracaibo Basin and thence to Colombia where he visited the fields in the Magdalena Valley. From there he traveled to Ecuador and Peru and then flew back to Los Angeles with a stopover in Mexico.

Incidentally, this year's Wing Ding, which was held at the Riviera Country Club, was the largest and one of the most enjoyable parties ever put on by the California NOMADS. It began with a golf tournament and concluded with a dinner and elaborate stage show at which 286 members and guests were present.

Many compliments were extended to the committee in charge of the affair of which Billy McGraw was chairman. George Trembley handled the golf tournament. The games of "skill" — played with phony money — were arranged by a committee consisting of Jim Robinson, Ray Humphreys, Reed O'Neil, Norman Dorn and Knight Templeton, assisted by guests Ross Wiley and John Shea. Prizes and finance were handled by Elmer Smith and Fred Tyler. Wally Sawdon directed the stage show "with assistants too numerous to mention". Prizes were awarded by a Hollywood screen star following the dinner.

PAUL E. FITZGERALD, geologist of Dowell Inc., recently returned to his home in Tulsa following a rapid trip through South America. Some of the impressions brought back by Mr. Fitzgerald are: the great amount of activity in exploration and drilling; major oil companies all expanding their field operations; geophysical service at a premium and in constant demand; production curve in Venezuela rising toward the million barrel per day mark, with well potentials rapidly approaching this figure; lack of field connections and tanker facilities rather than field production likely to delay the realization of this goal.

FIVE executives of the Sinclair Oil Company departed for Caracas a few weeks ago aboard the Venezuela Clipper of Pan American Airways. They are George Taber, William Gulette, John Hess, Thomas Kimball and Henry Malone. They went to join Harry Sinclair, president of the company, who has been in South America for the past several months. The trip is being made in connection with the elaborate program adopted by Sinclair for the development of its extensive holdings in the southern continent.

HAROLD F. MOSES has been made vice president of the Carter Oil Company with which he has been associated in various capacities for the past ten years. Joining the company as a geologist in 1934 he became chief of that department and assistant manager of exploration in 1938. Three years later he was advanced to the post of manager of exploration. In his new position he will direct the research and exploration activities of the company.

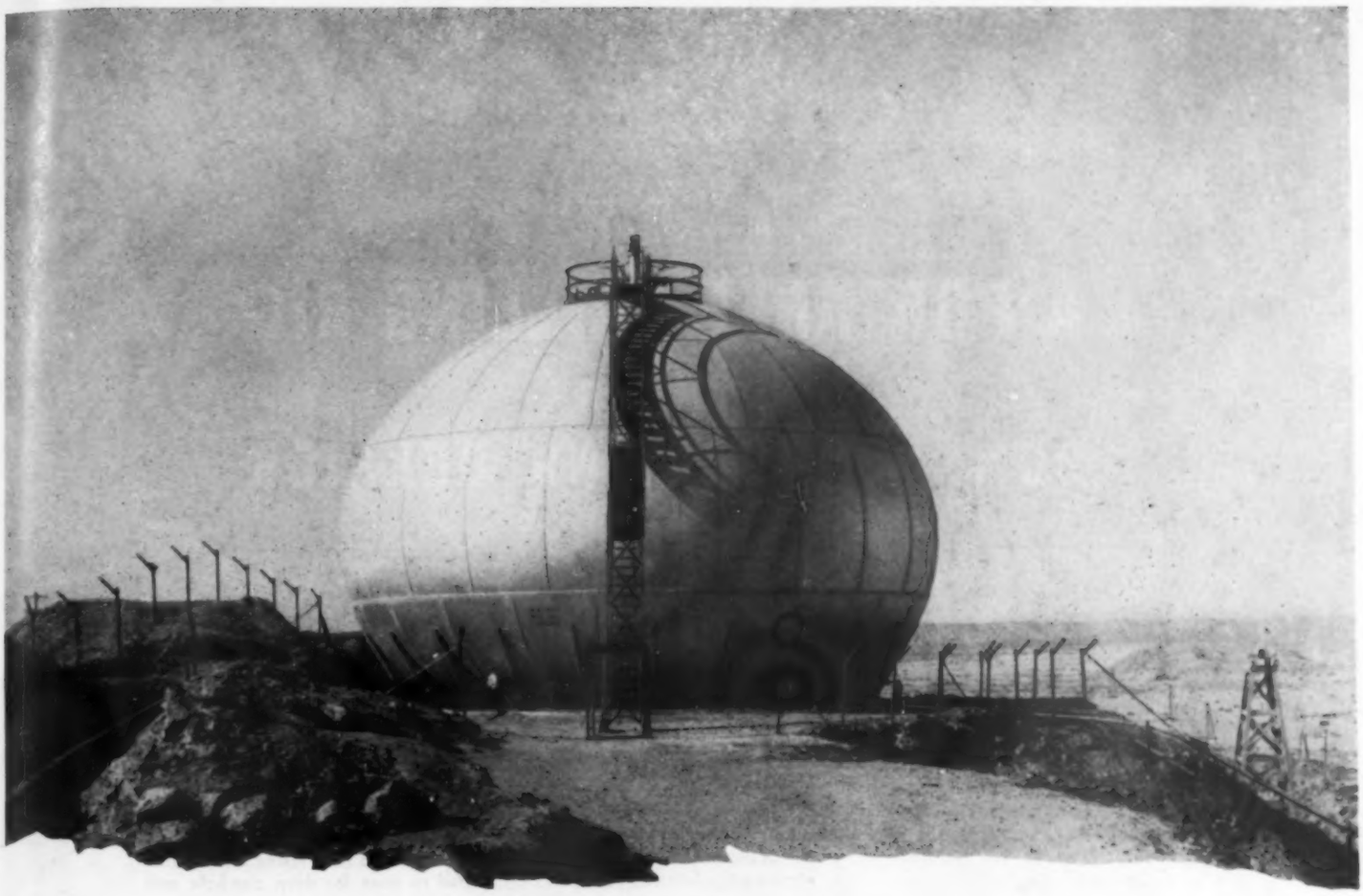
G. M. STEWART, export manager of the W-K-M Company, Inc., has returned from an extended tour of foreign oil fields which included Mexico, Peru, Ecuador, Colombia, Venezuela and Trinidad. In addition to handling the W-K-M line of equipment Mr. Stewart is export representative of Hunt Tool Co., Garrott Brass Co., Larkin Packer Co., Oil Well Survey Instrument Co., Houston Engineers, the Rig-A-Lite Co., and Hause Valve Co.

(*Continued on page* 106)

George J. Hanks

Paul E. Fitzgerald

G. M. Stewart



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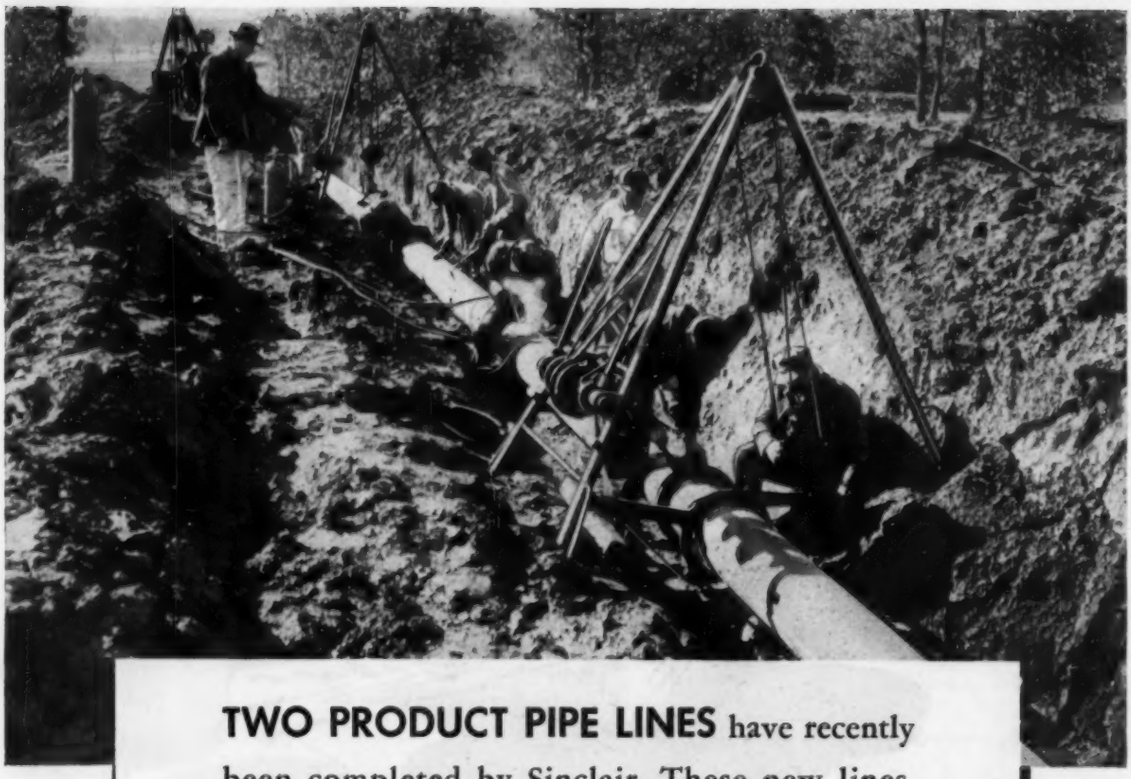

TWO PRODUCT PIPE LINES have recently been completed by Sinclair. These new lines, added to the Company's already existing 14,000 miles of crude oil lines, provide Sinclair with the most extensive pipe line system in the United States, operated by a single oil Company.

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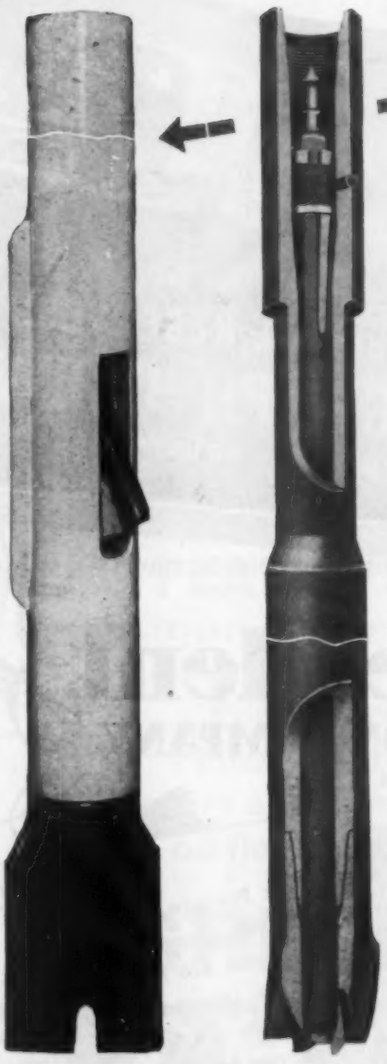

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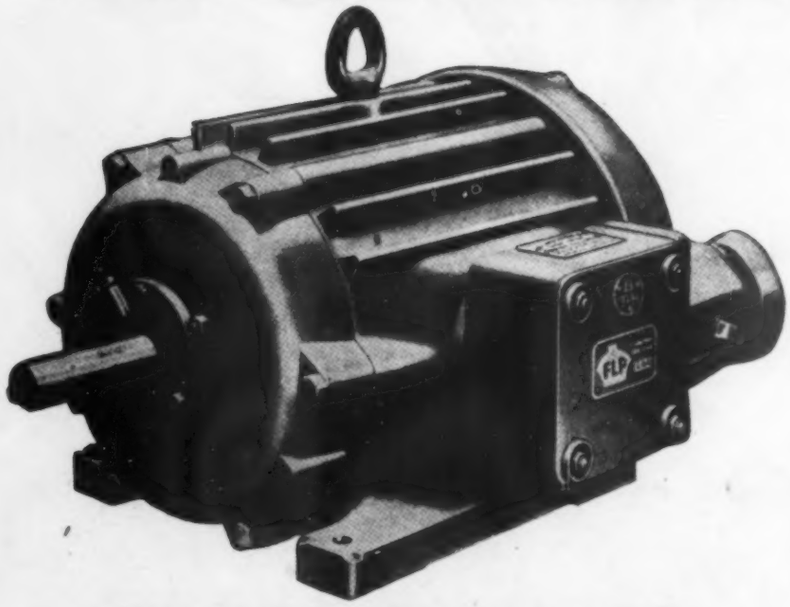

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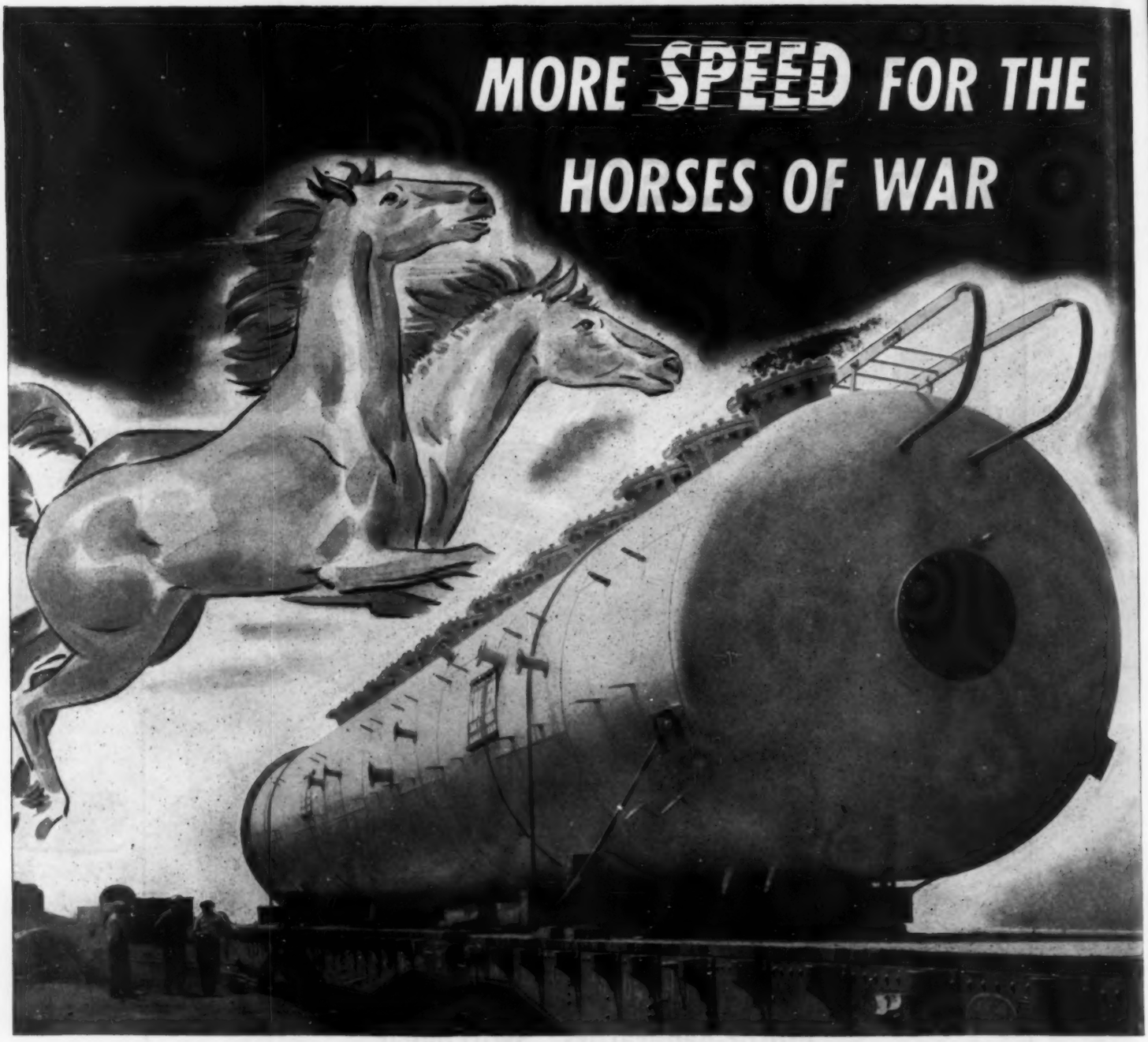

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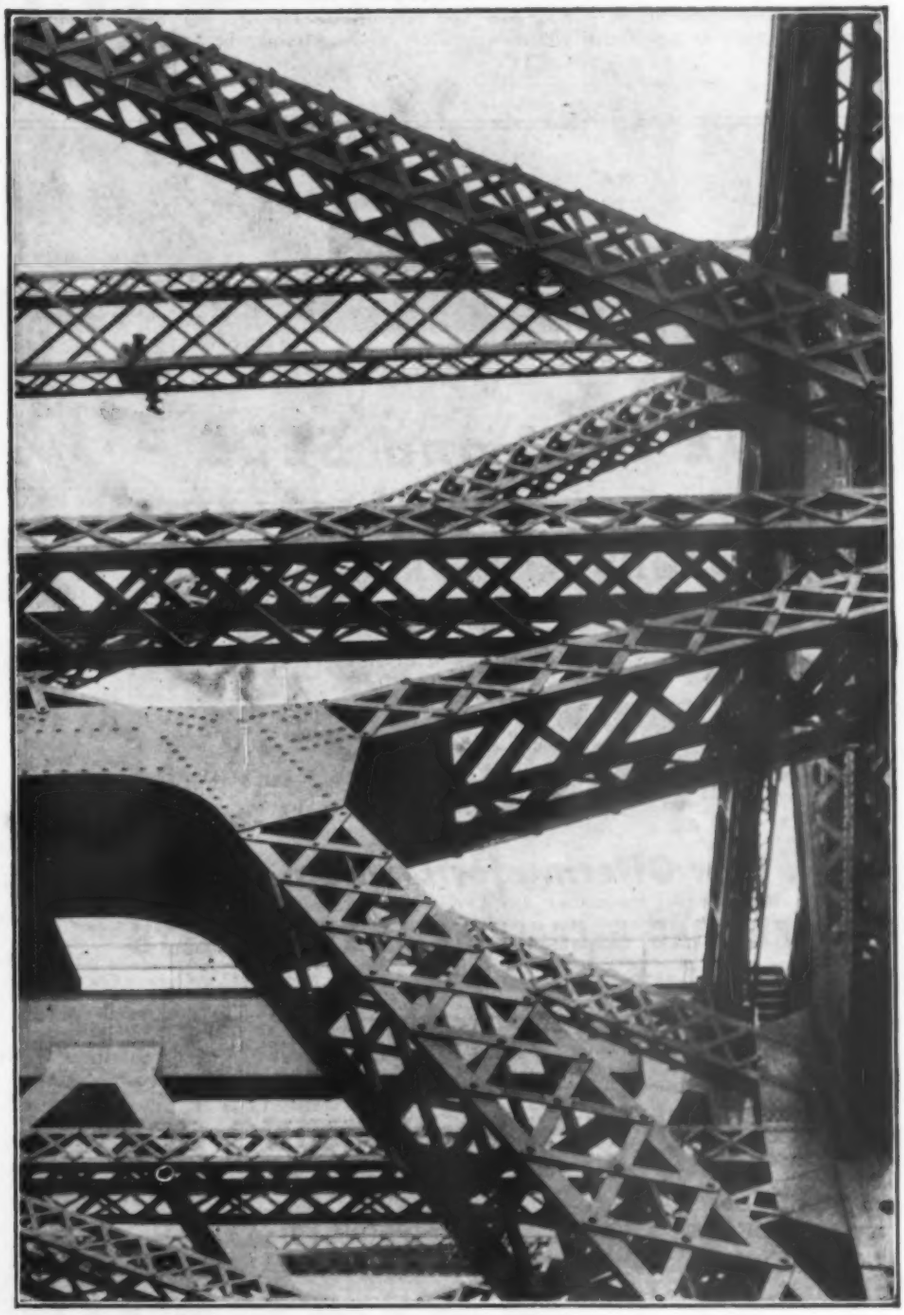

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WORLD PETROLEUM ABSTRACTS

Edited by Dr. O. W. Willcox.

OPERATION

Flowing Producing Wells in Secondary Recovery—Robert B. Rossler, before mid-year meeting of Directors, INDEPENDENT PETROLEUM ASSOCIATION, Bradford, April, 1944.

This is a report on progress in the flowing of secondary recovery wells as a preferred alternative to pumping. The reasons for and against flowing wells in a water-flood are summarized. On the one hand, operating costs and investment costs should be lower than when pumping. On the other hand, the lifetime of a flood well will probably be longer, capital may not be returned as rapidly, and the ultimate recovery in barrels may be somewhat smaller if the wells are flowed. Peak productions are not so high, the production is better distributed when flowing, and Federal taxes may be a less serious problem. As a whole, the verdict based on the author's Kansas experience is in favor of flowing in water floods; an added year or two of life will not add greatly to the total cost, a high water to oil ratio can be handled cheaply and operation costs can be progressively lowered when production declines. The author offers some practical hints that have been found useful in meeting various conditions.

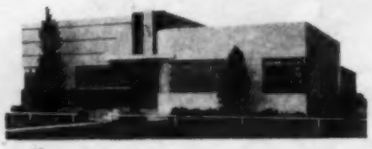
On the basis of experience to date in the flowing of producing wells in air and gas drive fields in the Pennsylvania area the author is equally convinced that it may become a practical method of producing oil in such fields. Wells that formerly produced 4,000 to 17,000 cu. ft. of gas a day are being flowed, though the shut-in pressure has fallen to 140 lbs. The pressure need not be even as high as this. By a system of periodic flow (which is described) a well 1,000 ft. deep, producing 1⅓ bbl. a day, is being flowed at a pressure of 50 to 60 lbs; flow at still lower pressures can be had where the gas volume is sufficiently large.

Some Recent Advances in Well Treating Methods and Equipment—P. E. Fitzgerald, before Division of Production, AMERICAN PETROLEUM INSTITUTE, Dallas, April, 1944.

The Dowell "electric pilot", which is an electrically operated interface locator that indicates the position of the interface between conductive and nonconductive fluids and which was originally intended for controlling the operation of selectively acidizing an oil well, has been extended as a new instrument in well surveying. A valuable use is the accurate location and evaluation of the permeable zones in a well.

In making well profiles with this device the usual procedure is to introduce enough salt water to cover the section to be surveyed and then to force this fluid into the formation at a constant rate by following it with oil. The rate of fall of the salt water-oil interface is determined by the interface locator. Naturally, the fall will be more rapid when the salt water is opposite a permeable zone. The data obtained are quantitative and when plotted show accurately the position and relative importance of the various permeable zones.

In general, the profile determined by the acid injection method agrees with the drilling-time log. Cases are cited in which there is observed an excellent correlation between the permeable zones indicated by the fluid injection log and the Schlumberger log. The method has also been used to survey wells in a secondary recovery project in West Texas in order to obtain data on the lateral and vertical distribution of the permeable zones penetrated by the different wells in reservoirs composed of limestone. The method has been used to determine whether production trouble was due to a plugged screen. Further uses are in recompletion and workover programs, and in general, to indicate the relative values of zones of permeability so that the poor ones can be properly treated.



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DRILLING

Methods of Sand Study in the Appalachian Basin—R. E. Sherrill and D. A. Busch, before American Petroleum Institute, Production Division, Columbus Meeting, April, 1944.

The Oil and Gas Division of the Pennsylvania Geological Survey has been endeavoring to learn all that is possible to know about the oil fields of that state in order that operators might appraise more intelligently their secondary recovery possibilities, plan their secondary recovery procedure and determine favorable areas for wildcatting. The method of approach is to make individual sand thickness maps. The principal problems which arise in making these maps are collection of data, selecting or constructing a suitable base map, correlation, and contouring.

The most serious difficulty in prosecuting the work is the poorness of the records made by the drillers, who differ in where they call the top and bottom of a sand. Some record only the pay sand, while others record the entire thickness of the body of sand, including shaly sandstone incapable of production. The position and thickness of the pay may be, but usually are not recorded. Accordingly, extreme and erratic differences in thickness may appear between closely spaced wells in a uniform sand. Such a sand is the Hundred-Foot in the Carnegie quadrangle. At first sight, contouring appears hopeless and meaningless. It is here that it is most necessary to have every record and to sufficient cores or electric logs, or at least to have interviewed the drillers sufficiently, so that the records may be properly interpreted. When this is done, a proper evaluation of the recorded thicknesses may be made and it is generally found that the sand body can be readily contoured and that the contours are smooth and normal. Where sufficient cores and logs are available, as in parts of Venango District, the pay sand may be contoured separately and its position, elevation, character and fluid content accurately determined. In southwestern Pennsylvania where sand maps have been prepared from driller's logs and company maps without cores, electric logs, or field work, only the sand body as a whole and the outlines of productive areas within it can be generally determined.

All this points up the desirability of accurate recording of all data from the beginning of an oil field's history, so that when it reaches the old age which every oil pool approaches it will be within the power of the operator to extract all the values which it is capable of yielding.

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E.L.I. Designed for Barnsdall Research Corporation the Hayward Mud Logging Equipment and has manufactured all the units presently used by Baroid in their Mud Logging Service in the United States and Seismograph Service Corporation in South America.

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EQUIPMENT IN WORLD-WIDE USE

CHEMISTRY

Furfural Solution Temperatures of Hydrocarbons—Harry T. Rice and Eugene Gieber, in INDUSTRIAL ENGINEERING CHEMISTRY, Analytical Edition, vol. 16 (1944) No. 2 pp. 107-110.

The "aniline points" of petroleum fractions is an important criterion of commercial refined petroleum products. At present aniline appears to have been accepted as the standard solvent in determining miscibility solution temperatures of petroleum fractions; however, it has a number of defects which make it desirable to find a more widely acceptable substitute. Aniline is a blood poison and its fumes are readily absorbed; while individual response differs, its high toxicity is generally admitted. Further, aniline cannot be used for the determination of the miscibility temperature of high aromatic-content petroleum fractions because of its relatively high freezing point.

A search for literature and an experimental study have indicated that furfural offers considerable promise as a reagent for the determination of miscibility solution temperatures. It is non-toxic and is directly applicable to petroleum fractions of high aromatic content, making possible the elimination of the mixed aniline point determination (aniline is completely miscible in petroleum fractions containing approximately 50% or more of aromatic hydrocarbons).

The apparatus and procedure are essentially those described by Williams and Dean for the determination of aniline points. All test mixtures were prepared volumetrically by means of a buret.

Furfural miscibility temperatures below about 30° C. are obtained with the same apparatus and procedure, except that cooling instead of heating is employed. The cooling medium comprises isopropyl alcohol and dry ice, the dry ice being added slowly to a point slightly below immis-

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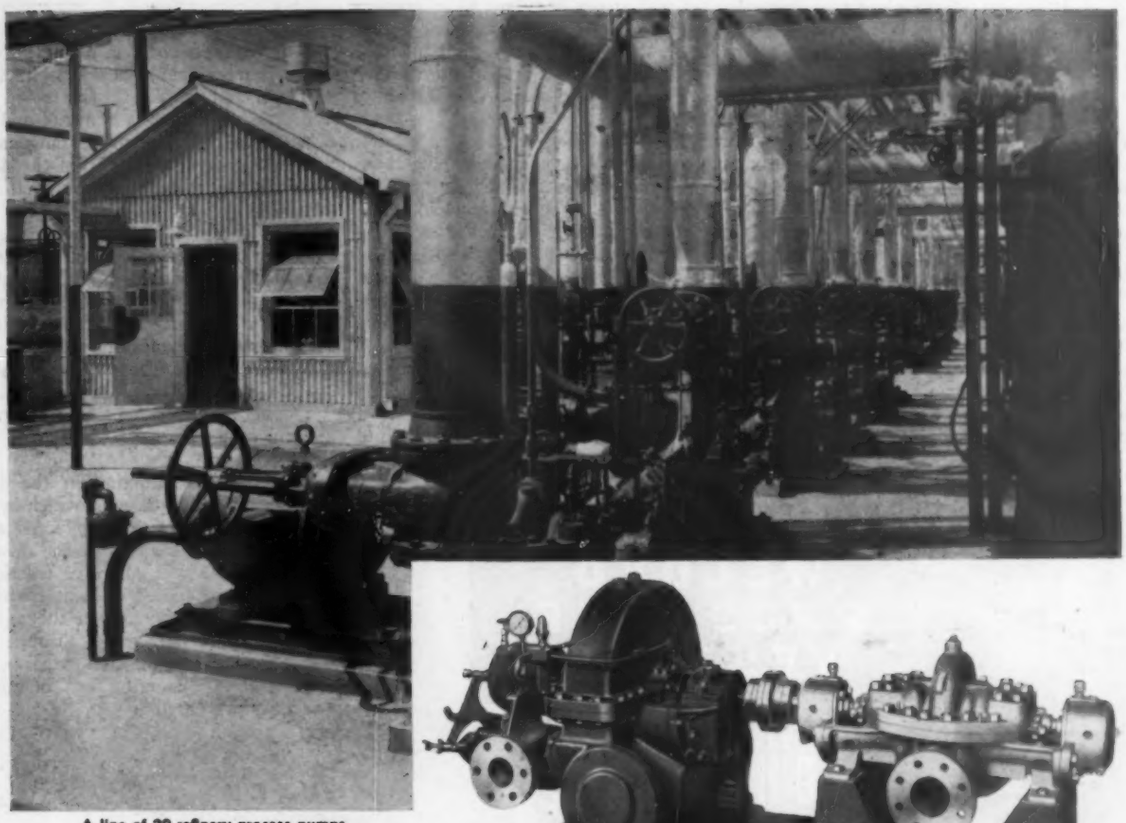
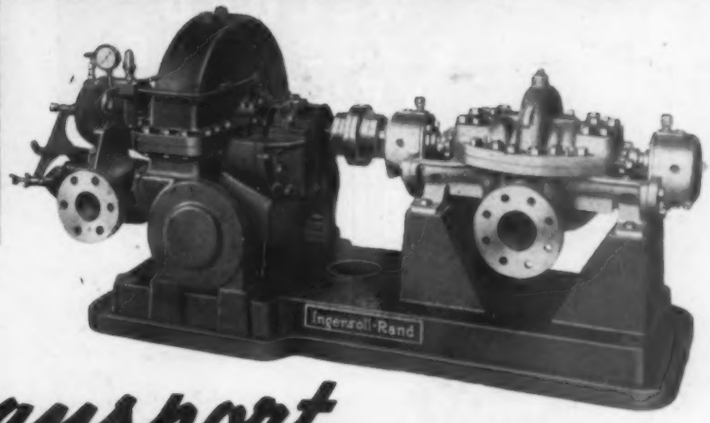


A line of 20 refinery process pumps.



LIQUID *Transport*

■ Pumps are the transportation system of the refinery. Crude oil is moved through miles of pipe from one process to another before it emerges as aviation gasoline, butadiene, lubricating oil and a host of other products. In addition millions of gallons of water, catalysts and other products are required in various processes.

Ingersoll-Rand has a complete line of refinery pumps. For each specialized job, there is one correct unit, ranging from the versatile single-stage process pump to specialized pumps for handling liquid catalyst or for hot-oil charging.

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T IN BINDING

cibility. The bath is then allowed to warm spontaneously to the point of miscibility and the temperature recorded.

The furfural should be very pure and freshly distilled; after several weeks it becomes unsatisfactory for this use and must be redistilled and restandardized.

A Simple Test for Measuring the Corrosivity of Used Engine Oils—R. G. Larsen, F. A. Armfield and L. D. Grenot, before AMERICAN CHEMICAL SOCIETY, Cleveland Meeting, April 1944.

A test for determining the corrosivity of used engine oils independently of previous history has been devised. The test provides a means for evaluating in simple fashion, by the use of test strips coated with lead or other metal in graduated thicknesses, a property of used oils not heretofore satisfactorily measured by routine engine oil tests. It also has practical application in determining the cause of bearing failures and indicating necessary oil drain periods. The relation between the property measured and the usual engine inspection data is discussed.

REFINING

A Record Pipe Still Run—John P. O'Donnell, in OIL & GAS JOURNAL, Vo. 42 (1944), No. 46, pp. 111-113, 115.

A crude pipe still at the Standard Oil Company of New Jersey's Bayway refinery recently completed a 6,366-hour run (nearly nine months) during which 10,285,561bbl. of oil were charged to the unit at an average rate of 38,813 bbl. a day.

The design of this still is unusual in several respects, one of which is the introduction of intermediate reflux systems. The 125-foot column is divided into three sections, the upper section having a considerably reduced diameter instead of being as large or larger than the middle section. A lower heat load is carried in the upper section, due to the use of a large intermediate reflux stream in the top of the middle section, which makes it possible to build the top section smaller. A second intermediate reflux or pump-around system located below the heavy naphtha drawoff serves the upper section. The final pump-around system is below the diesel oil drawoff and pump back cooled stripped diesel oil. The heat withdrawn by the three pump-around streams is used to preheat the charge and, because of the higher temperatures, this heat is better suited for this purpose than overhead vapors.

Another unusual feature is the combining of the sidestream strippers in a single column, bringing the four strippers—heavy naphtha, kerosene, diesel oil and paraffin distillate—in one unit, thus decreasing heat requirements and lowering construction costs. In this arrangement the bottom of a higher stripper serves the next lower one. Each stripper contains four bell-cap plates.

One of the most distinctive features of this system is the use of flash drums ahead of the furnace. The crude enters the flash drums after picking up heat from an exchange system which includes exchangers through which the above-mentioned intermediate reflux streams circulate. The drums were installed to provide a method of flashing off the moisture-containing vapors at a point in the systems where no salt deposition could occur.

The pressure reduction in the drums vaporizes the water and light ends, which bypass remaining exchangers and are introduced into the charge stream six tubes ahead of the furnace outlet. As a result, the wet corrosive fraction is excluded from the remaining preheat exchangers and all but the last of the furnace tubes; the dehydrated flashed crude only passes through the high temperature exchangers and furnace, with the result that the "freezing out" of salt on tube surfaces is prevented.

USES

Factors Relating to Postwar Motor Gasolines—Alberta H. Adams and B. H. Weil, before AMERICAN CHEMICAL SOCIETY, Cleveland Meeting, April, 1944.

Consensus among automotive and petroleum experts indicates that some 15,000,000 of the nation's prewar 30,000,000 cars will remain in operating condition at the war's end, maintaining, with the help of some military consumption and increased commercial and farm use, a volumetric market for gasoline of at least 75 percent of the prewar level. A rapid recovery to or above normal prewar use is expected to follow as new tires and cars come into production. The immediate postwar cars will probably be the 1942 models, with changes in automobile design expected to come slowly. One hundred-octane automotive fuels are not expected to be required for some years, if ever.

GENERAL

Present and Future Trends in Motor Fuels—Cecil E. Boord, before AMERICAN PETROLEUM INSTITUTE, PRODUCTION DIVISION - Columbus Meeting, April 1944.

The author accepts the opinion of Wallace Pratt that the proved reserves of the United States now bulk some 20 billions., that natural gas reserves are equivalent to 17 billion bbls. of liquid petroleum, and that the proved reserves in foreign properties of American nationals constitute another 20 billion bbls. or more; thus the total proved reserves discovered and developed by

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HYDROGEN PLANTS
as applied to
CRACKING OF PETROLEUM
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EVAPORATORS
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8'-0" DIA. x 39'-6" LONG

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THE POWER-GAS CORPORATION LTD.
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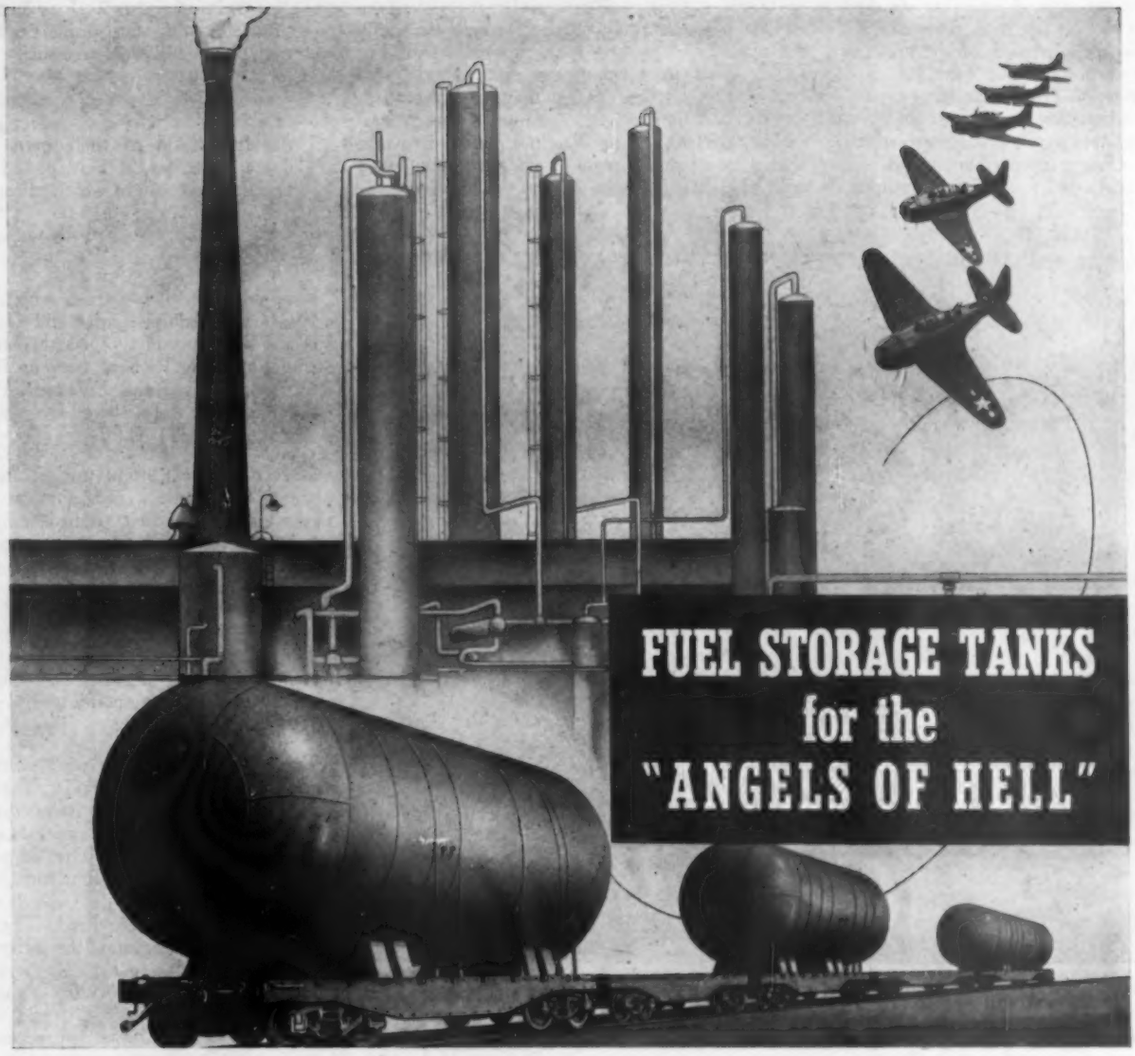

High-octane flying fuel is being manufactured and stored in enormous quantities in welded pressure vessels made by General American. In every quarter of the globe, military and industrial experts recognize the GATX symbol as signifying quality. GATX-built equipment, backed up by GATX Know-How, can effect production economies for *you!*

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Specialists in plate fabrication — manufacturers of pressure vessels of steel, alloys and aluminum—all classes of welding — process equipment of all types—chemical engineering laboratories and service—completely equipped field erection department.

T IN BINDING

Americans at home and abroad are of the order of 60 billion bbls. Beyond these petroleum reserves are reserves of tar sand oil, shale oil and liquifiable coal.

The refiners of the future will find that refining operations now in hand will, with some modification and adaption, be adequate for the production of suitable motor fuels. Thermal and cracking, hydrogenation and dehydrogenation, dealkylation and alkylation, cyclization and decyclization, polymarization and depolymerization, reforming, hydroforming, aromatization and isomerization cover the entire range of refinery operations and are sufficiently flexible in their application to meet new conditions as they arise.

Regardless of the source of the raw materials the motor fuels of the future will be saturated and unsaturated, cyclic and non-cyclic, paraffinic, olefinic, naphthenic and aromatic. They will contain the same hydrocarbons as the present fuels. The engine data now being accumulated will still apply. The cost per gallon may be greater but the octane number will continue in the general vicinity of 100 and up. Engines designed to take advantage of the increase in available power may hold the cost per mile at the present levels or even cause it to be lowered. One can have faith that the petroleum technology which has served so well the generation just past will continue to serve the generations which are to come.

Note: It may be well to remember that "reserves in foreign properties of American nationals" will not necessarily be available for consumption in the United States. These reserves are under the jurisdiction of foreign sovereignities who may assert control over the disposition of their own national resources, subject, it may be, to an international agreement to which all consent. - Ed.

BOOK

Handbook of Chemistry—Compiled and Edited by Norbert Adolph Lange and Gordon M. Forker, With Appendix of Mathematical Formulas and Tables by Richard Stevens Burington; 5th Edition, Revised and Enlarged, Published 1944 by Handbook Publishers, Inc., Sandusky, 2092 pages 5⅜ x 7¾; $6.00.

This reference volume for all requiring ready access to chemical and physical data used in laboratory work and applied in manufacturing, now appears in a new edition that has been enlarged by the addition of 489 pages to accomodate tables not appearing in previous editions, together with previous tables that have been extended, and material that has been rewritten. The table of physical constants of organic compounds has been increased to include 6507 compounds and a corresponding list of more than 3500 synonyms.

Tables not in the previous edition, and now offered, include the Periodic Table (Deming), flammable liquids, flame temperatures, plastics, fluoresence of chemicals, minerals and gums, water for industrial use. The 28-page index has close to 5000 entries that direct the reader to as many presentations of data which chemists in all lines have occasion to need. The printing and binding are good, and the price asked seems modest in relation to the scope and utility of the handbook. The fifth edition appears within three years after the fourth; in its present enlarged form it will be appreciated at least as much as its predecessor.

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When mud and muck threaten to bog things down, there's one friend you can absolutely depend upon to see you through. That's a reliable, always-on-the-job HYSTER winch. HYSTER Worm Drives thrive on heavy towing jobs, in fair weather or foul. Mounted on your "Caterpillar" tractors, they employ their tremendous pulling power—straight on or from various angles—to furnish the smooth operation for carefully spotting machinery on its foundation at the well. They do the seemingly "impossible."

You'll find many uses for this "all-weather" friend; more than enough to justify its modest upkeep. Indispensable is the word.

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all adding up to increased destruction of your engine cylinders.

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PORUS-KROME is hard chromium, applied to cylinder walls by the patented process discovered by Hendrik van der Horst. It has tiny pockets in the surface which hold lubricating oil and feed it back as needed. And chrome's resistance to corrosion is well known.

While the process is new to most U. S. civilian engines, thousands upon thousands of engines have been treated with PORUS-KROME for use in the armies and navies of the United Nations. Here, where severe usage and constant operation make reliability all important, PORUS-KROME has proved its value.

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FOREIGN OIL LEGION

(*Continued from page 86*)

JOSEPH A. KORNFELD, Houston, Texas has joined the Texas Company as petroleum engineer in the West Texas-New Mexico division reservoir studies and evaluations.

Prior to joining The Texas Company, Kornfeld was engaged in metallurgical research with The Hughes Tool Company at Houston. Earlier he was engaged in preparation of evaluations and appraisals in a consultant capacity for a number of mid-continent oil producing firms.

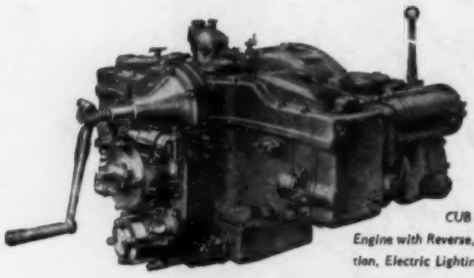
During 1941, at the request of Gov. Andrew F. Schoeppel of Kansas, chairman of The Interstate Oil Compact commission, he prepared the first nation-wide survey on secondary recovery projects covering pressure maintenance, gas repressuring and water-flooding in 16 states. This report was read by Kornfeld before the American Petroleum Institute in Tulsa at its annual spring meeting at the request of Paul D. Torrey, chairman of the subcommittee on secondary recovery to which he was named.

Kornfeld studied at the University of Oklahoma, the University of Tulsa and the University of Wichita. He is a member of the American Institute of Mining and Metallurgical Engineers and the American Society for Metals. He has been a frequent contributor to WORLD PETROLEUM and is the author of numerous papers on petroleum engineering and geological subjects which have appeared in leading scientific and technical publications during the past 12 years.

Joseph A. Kornfeld

R. H. GWINNER has joined Sunray Oil Company as chief engineer succeeding K. R. Teis, recently resigned to enter consulting practice. Gwinner, prior to his new post, was senior exploitation engineer, Shell Oil Company, Tulsa.

MARINE · STATIONARY · VEHICLE



CUB 12 h.p. Marine Engine with Reverse, 2 to 1 Reduction, Electric Lighting and Starting

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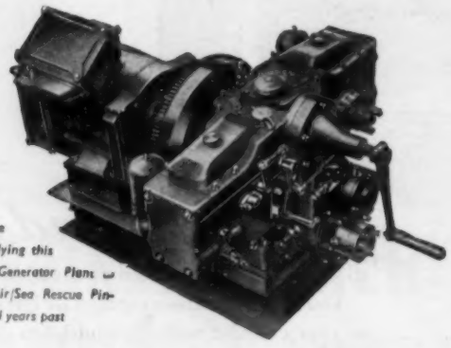
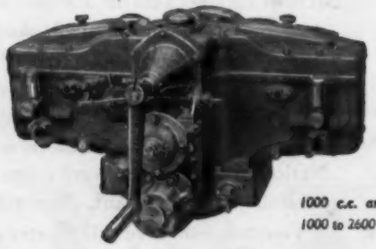


We have had the honour of supplying this standard CUB Generator Plant to R.A.F. 60 ft. Air/Sea Rescue Pinnaces for several years past

Small Diesel



1000 c.c. and 1135 c.c. 2 cyls., 1000 to 2600 r.p.m., 300 lb. weight

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Home front news is vital on the fighting front. Write a fighting man today.

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SEE HOW PIPE AND CASING ARE PROTECTED

HERE is visible unretouched evidence of the vital role which Patterson-Ballagh Casing Protectors play in the war against wear. The center stand is unprotected. Tool joint wear is readily seen. This means the casing, too, is taking a beating. Tool joints of the other stands show no abrasion as evidenced by the many tong marks.

The smaller photograph shows balance of the same string, all with lipped Protectors, and all well protected, *except* for that *one* maverick, first row, third from the left!

This string has just come out of the hole. Drill pipe and the floor beneath are clean as a whistle. This means only one thing—a Patterson-Ballagh Pipe Wiper has been at work.

Patterson-Ballagh Products are now made of PBX synthetic rubber—a development which has meant added resistance to oil and weather.

Note wear on the stand third from left... Others are clearly protected with Patterson-Ballagh Protectors.

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GRADUATE CHEMICAL ENGINEERS FOR PETROLEUM REFINERY AS WELL AS OTHER HIGHLY QUALIFIED TECHNICAL REFINERY AND OILFIELD PERSONNEL required for Arabian American Oil Company's operation in Saudi Arabia. Engineers experienced in petroleum refinery design and operations desirable but not essential. Extensive training on refinery equipment will be provided before leaving the United States. Employment offers splendid opportunities for advancement and post-war security. Good working conditions, hospital and medical care, liberal benefit plans and vacation privileges in the United States. If genuinely interested in a foreign assignment, please send full information covering experience, references, transcript of college record, draft and availability status to our Relations Department, 200 Bush Street, San Francisco 4, California.

JOHN KEYES, Engineering Laboratories, Tulsa, has been elected chairman of the Mid-Continent section, A. S. M. E., for the coming fiscal year. Also elected were R. A. Colgin, W. C. Norris, Inc., Tulsa, secretary; Carl Stevens, WPB, treasurer; and D. E. Fields, Tulsa, W. S. Sherman, Oklahoma City, E. S. Barnett, Amarillo, A. G. Blanchard, Shreveport, H. T. Sears, Bartlesville, as vice chairmen. New directors are C. O. Glasgow, A. J. Kerr, R. K. Lane, Roscoe Ayers, B. P. Sibole, W. Heltzel and D. O. Barrett, all of Tulsa.

John Keyes

J. S. MONTGOMERY has resigned as regional superintendent, Phillips Petroleum Company, to enter private business as a drilling contractor. His resignation became effective as of July 1.

Montgomery has been with Phillips Petroleum Company 13 years, and has served in his latest position for two years. He is present chairman of the Mid-Continent District, Division of Production, API.

His firm will have its headquarters in Oklahoma City and will operate principally in Kansas.

O. B. HOPKINS, whose activities for many years past as chief geologist of Imperial Oil Ltd., have given him complete familiarity with the company's field operations, has been made vice president in charge of production. Mr. Hopkins is completing twenty-five years of service with Imperial having joined the company in 1919. His early experience included several years spent in connection with the development of the De Mares concession in Colombia operated by Imperial's subsidiary, the International Petroleum Company Ltd., and he is now a director of that company. He has been closely identified also with the expansion of Imperial's producing interests in Western Canada.

O. C. Wheeler, formerly geologist to International in Colombia, succeeds to the post formerly occupied by Dr. Hopkins with Imperial and Dr. T. A. Link who has been in charge of geological work in the Turner Valley area has been transferred to the home office in Toronto as assistant chief geologist.

E. G. "TY" DAHLGREN, technical secretary of Interstate Oil Compact Commission, Oklahoma City, has been elected 1944-45 president of Oklahoma City Geological Society, succeeding I. Curtis Hicks, Phillips Petroleum Company. T. G. Glass, Sinclair Prairie Oil Company, was elected vice president and C. E. Hamilton, Consolidated Gas Utilities Company, was elected secretary-treasurer of the Society for the forthcoming fiscal year.

CECIL HAGEN of Houston widely known as a consulting geologist prior to the war when he entered the Navy as a Lieutenant, has been assigned to command of the naval training squadron at Dallas.

AS reported in these pages last month B. Th. W. Van Hasselt, formerly head of Royal Dutch Shell interests in Venezuela, was recently elected a managing director of the Royal Dutch Shell Group, with headquarters in London. It has now been announced that John H. Loudon, former assistant general manager in Caracas, has been appointed to replace Mr. van Hasselt as general manager of the Caribbean Petroleum Company.

Born in Netherlands in 1905, Mr. Loudon entered the services of the Royal Dutch Shell Group in the secretarial department at The Hague in 1930, following his graduation from the University of the Utrecht as a Doctor of Laws. In 1932, Mr. Loudon was assigned to the United States and, after training in various administrative positions with the Shell Oil Company in the eastern division, he was named an assistant to the vice president in 1933 and served in that capacity until early in 1936. He then joined the Shell Oil Company of California, where he served until his appointment to Caracas late in 1937.

OIL DISTRIBUTION

The Great Western Railway Company's South Wales Docks at CARDIFF, SWANSEA, NEWPORT, BARRY, PORT TALBOT and PENARTH (Harbour) are excellent terminals for oil distribution.

SITES FOR NEW DEPOTS ARE AVAILABLE

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For information apply to the respective Dock Managers or to :—

W. J. THOMAS,
Chief Docks Manager,
Great Western Railway,
CARDIFF

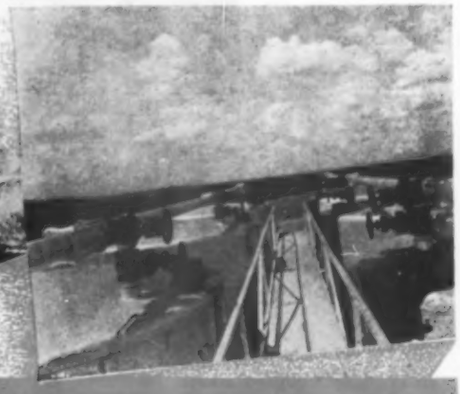
JAMES MILNE, *General Manager.*
Paddington Stn. London, W.2

"DRESSERS" in Action

These few photographs, chosen at random, indicate the nature of the various uses for Dresser flexible Couplings. For over fifty years Dresser Couplings have been the solution to difficult pipe-joining jobs. Applicable wherever pipe may serve in the production and handling of oil and petroleum products, they make pipe-joining work easier, faster, safer and tighter. The few standard parts are easily assembled over pipe ends and bolted in place. No pipe-end preparation and no exact pipe fitting are necessary. Any workman can make leak-proof joints in a few minutes—and these joints, automatically absorbing expansion, contraction, vibration and deflection, will remain tight under all usual and many unusual operating conditions. Sizes ⅜" to 24" and larger.

Coupling design and working principle are briefly described in the Dresser Oil Fields Catalog, which fully covers leading products of the Dresser line. If you would like a copy, please write for Form 4012 W.

Dresser Couplings, Fittings, Repair Clamps and Sleeves are available on short notice from leading jobbers and direct from Dresser at Bradford or the Dresser Houston Warehouse.



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KERR MADE SALES MANAGER

A. J. KERR, Pittsburgh Equitable Meter Company, has been promoted to general sales manager of the firm and has moved to the Pittsburgh headquarters of the Company. Previously, Kerr was district manager in Tulsa. His new office will handle sales to all states.

Kerr, widely known through the oil country, is a past chairman of the Mid-Continent Section, American Society of Mechanical Engineers; is a past president of Engineers Club of Tulsa, and a mainstay in the Meter School, an annual technical meeting of gas measurement engineers at the University of Oklahoma, Norman.

Born near Butler, Pa., he became an oil man at an early age, and after graduating from Carnegie Institute of Technology, he continued in the petroleum industry. He entered the Mid-Continent area in 1920.

CARTER OFFICIALS TRANSFER

F. W. BRUNER, superintendent of production for the eastern division of The Carter Oil Company with headquarters at Mattoon, Illinois, is transferring to Billings, Montana, office where he will assume active managership of the Northwest Division. He replaced J. R. McWilliams, vice president and director of the Company who is on leave of absence to PAW as director of production. R. J. Sullivan succeeds Bruner at Mattoon.

ORR JOINS GAS ASSOCIATION

INDEPENDENT Natural Gas Association of America is to open an office in Oklahoma City as a regional center of activity. Charles L. Orr, who recently resigned as general secretary of the Interstate Oil Compact Commission will be in charge. The decision was reached in Tulsa where representatives of seven natural gas firms laid initial plans for the opening of the office.

PIPE LINE ENLARGEMENT

MAGNOLIA PIPE LINE COMPANY, Dallas, is adding capacity to its 335-mile, 12-inch line from West Texas to Corsicana. Power and pumping facilities being added to the line, currently of 42,500 barrels capacity, will boost its carrying capacity to approximately 55,000 barrels daily. Pumping facilities being installed have already been in service on a paralleling 8-inch line, and will increase the pump stations from three to seven on the larger artery. Work consists chiefly of switching facilities already available to connections on the 12- inch carrier.

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STEVENS Ring Type Cylinder Head Gaskets. Guaranteed not to blow-out or burn-out under high pressure. The best cylinder head gasket made for any gas engine your money can buy — not a critical material.

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Oil Property Map of Colombia

Scale: 1 to 1,000,000
Showing in Color

1. Concessions in force of major operators
2. Private oil properties, with firm title
3. Concessions tested and surrendered
4. Location of all wildcats drilled in the country; depths, oilfields; pipelines and stations
5. Concession applications officially accepted Measures 1.80 x 1.05 meters (6′ x 3.5′)

E. OSPINA-RACINES
Apartado 27-33
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"Newall Hi-tem"
BOLTS & STUDS

Metallurgists have always been important to engineers but now they are essential.

One of the major developments in engineering is the use of high pressure steam with its accompanying high temperatures.

Normal steel is not suitable for operating at the extreme heat necessary, so the metallurgist has come to the aid of the engineer and has introduced a new type of steel with non-creep properties.

With this at our disposal we have been able to develop Newall Hi-tem bolts and studs.

In addition to their non-creep qualities, Newall Hi-tem bolts and studs have elastic properties of great importance for high pressure work.

They have threads which are not only extremely accurate but have other characteristics necessary for such conditions.

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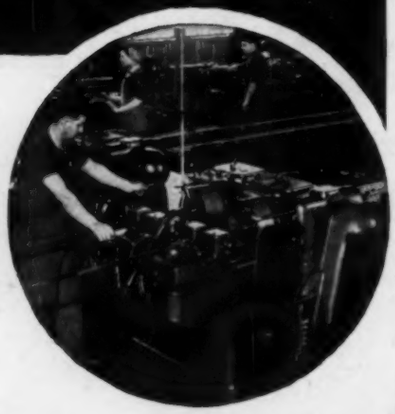
HIGH TEMPERATURE

Bolting

TO YOUR SPECIFICATIONS



ERIE continuous threaded studs are processed from various types of alloy steel on these continuous bar threading machines—any recognized thread specifications can be met. Erie, by close contact with large users of threaded studs, has developed special threading classified to meet high temperature conditions. Over 31 years of bolting experience qualify Erie to build to your specifications.

ALLOYS • STAINLESS • CARBON • BRONZE

ERIE Bolting

ERIE BOLT & NUT CO • ERIE, PA.

ANGLO-AMERICAN ACCORD

(*Continued from page* 55)

as available reserves, sound engineering practices, relevant economic factors and the interests of producing and consuming countries and with a view to the full satisfaction of expanding demand". In solving this problem the commission must also provide that "the development of petroleum resources and the benefits received therefrom by the producing countries shall be such as to encourage the sound economic advancement of those countries".

It is in this respect that industry is on the alert for the pitfalls of government cartels and price-fixing which must be avoided. Two approaches to the establishment of world quotas have been advanced. One would provide for a minimum production quota which would assure the producing country of its fair economic necessities plus a maximum production quota which would vary according to world demand and would supposedly represent that portion of the world market allocated to the country by the decision of the Commission.

The second plan would establish only the minimum production quota and allow the rest of the country's production to enter the world market in free competition and with only such limitations on the country's maximum production as good engineering practice and sound conservation policy would impose.

The second plan avoids the cartel and price-fixing evils to which the first plan might be open and it is the one most likely to be adopted. However, there will be considerable discussion of the matter and even the creation of a formula for ascertaining a country's minimum production quota will present a weighty problem.

The multilateral government conferences which the agreement provides for will probably take place within two months time. Considerable groundwork must be laid in discussing the proposed conference with the other producing countries, to ascertain their ideas and the problems which will arise, so that an orderly agenda may be planned and so that the conference will reach an accord with the ease and amicability of the Anglo-American agreement.

Although the British and Americans have now made a clear statement of the principles under which they propose to operate in other countries, the countries themselves will have ideas as to whether or not they consider these principles to be in accord with their individual national interests. The hard economics of an international oil agreement is a real testing ground of the desire of all countries to build for a lasting peace as certain sacrifices will be required to assure certain gains.

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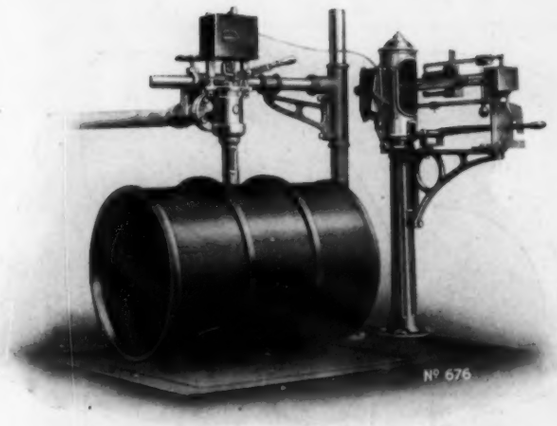

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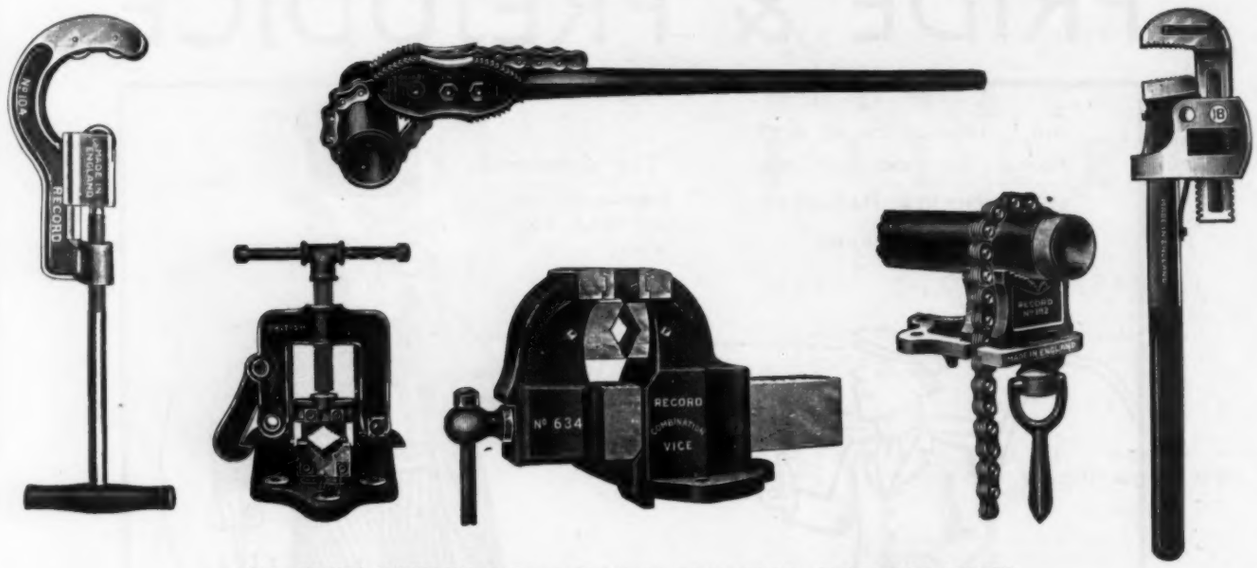

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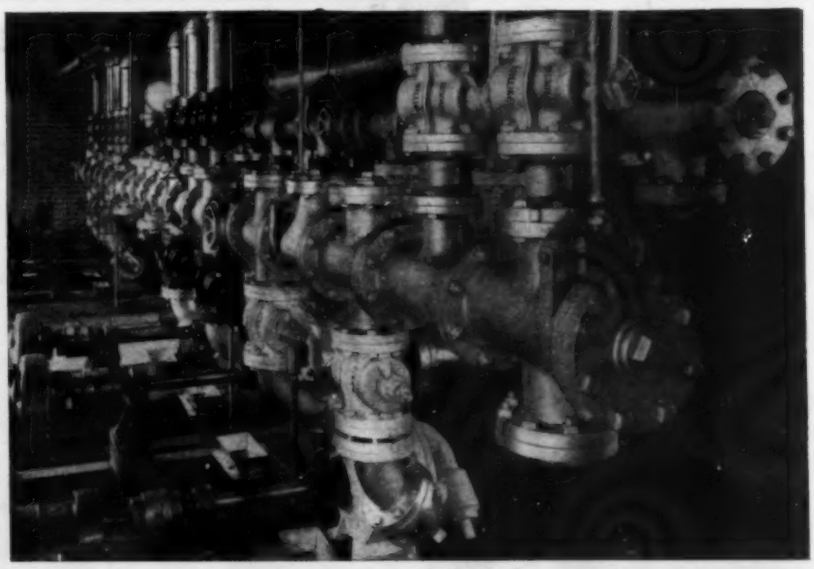

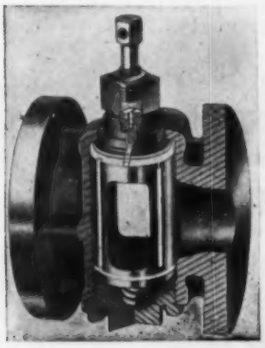

★ This sectioned illustration of a flanged Newman-Milliken Valve shows the cylindrical plug and lubricant ducts which seal the valve against leakage and ensure easy operation at all times. A rectangular port valve is shown, but full round port valves are also manufactured.

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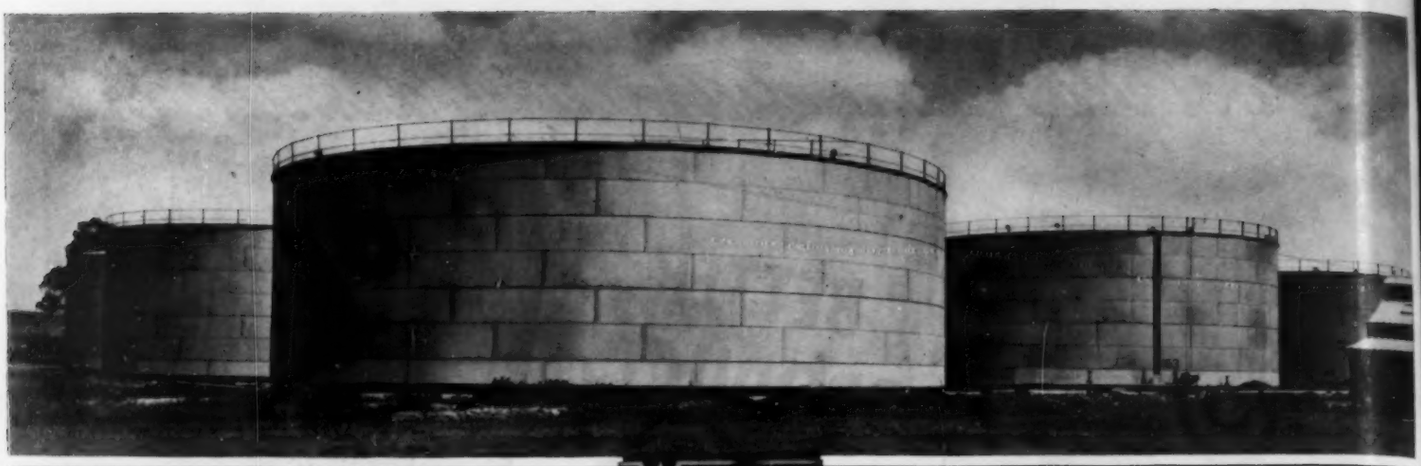

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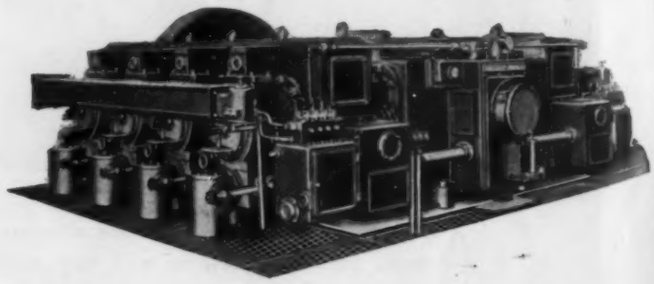

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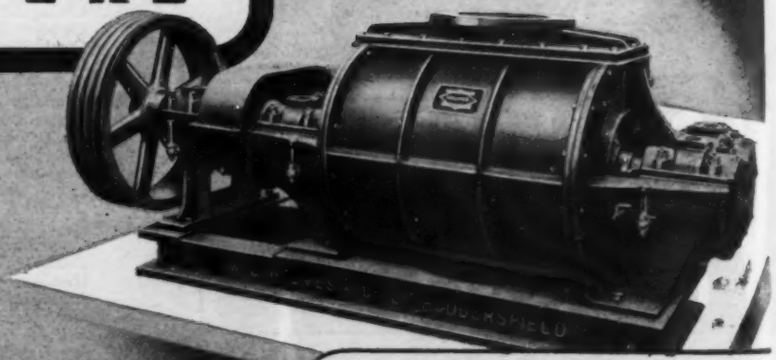

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The Permian Basin area of West Texas has gained a marked increase in activity as a direct result of increased outlet facilities into Oklahoma connections in addition to carriers already in service to the Coast and east. Fullerton field, northern Andrews County, is currently the most active in the drilling phase. Increased exploration is being undertaken to establish Ellenburger (Ordovician) production in wildcat territory, with development of the recently discovered Keystone Ellenburger at 9,500 feet acting as an incentive in this direction. Keystone Ellenburger is saturated for a known and proven 500 feet, with the upper part of the formation carrying distillate.

Proved and semi-proved tracts scheduled for early drilling are on the upgrade, with deep prospects awaiting only rigs and materials. A particular shortage exists in units capable of drilling to 10,000 feet, and these are put to work as soon as they can be obtained.

Equipment to drill the Permian lime pays to 7,000 feet is more readily available, although there is no surplus. Redrilling operations to newly discovered deeper pay formations, is an added program in a number of established fields. From the scope of activity, it is apparent that West Texas will remain highly important as a source of new crude for many years.

HENDY POST WAR PLANS

MANUFACTURE of mining and petroleum equipment, some of it embodying new principles of design and construction, will be resumed by the Joshua Hendy Iron Works of Sunnyvale, Calif., when present war contracts permit, officials of the company indicate.

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Reconversion will present few problems to the Hendy plant, since turbines, Diesels, and turbo-generators will continue in production after the war without interruption; and the large quantity of general-purpose machine tools with which the plant is equipped will make it easy to return to the manufacture of products for the commercial field, some of which are already fully prepared for.

WATER FLOOD PROJECT

A request is before Oklahoma Corporation Commission for permission to actuate a water flood on a restricted area of the old and famous Oklahoma City field. Application for permission was made by Cities Service Oil Company, Bartlesville, to be applied on their Jones lease, in the northwest quarter of 31-11n-2w, in the southeast area of production. The designated well, No. 9, will be deepened into the Johnson zone upon approval of the request.

Oklahoma City field, now producing at a rate of 43,500 barrels daily from all horizons, has been the subject of an extensive survey, extending over some six years, as to the feasibility of repressuring the second Wilcox (Ordovician) sand, the major producing stratum of the field. A majority of operators were represented in this engineering analysis which generally supported the practicability of gas repressuring to recover that crude which will remain in the pay after normal producing methods are no longer economical. One of the more serious drawbacks to such a program, is the extremely wide dispersal of interests and ownerships, and the difficulty in gaining the unanimity of approval required.

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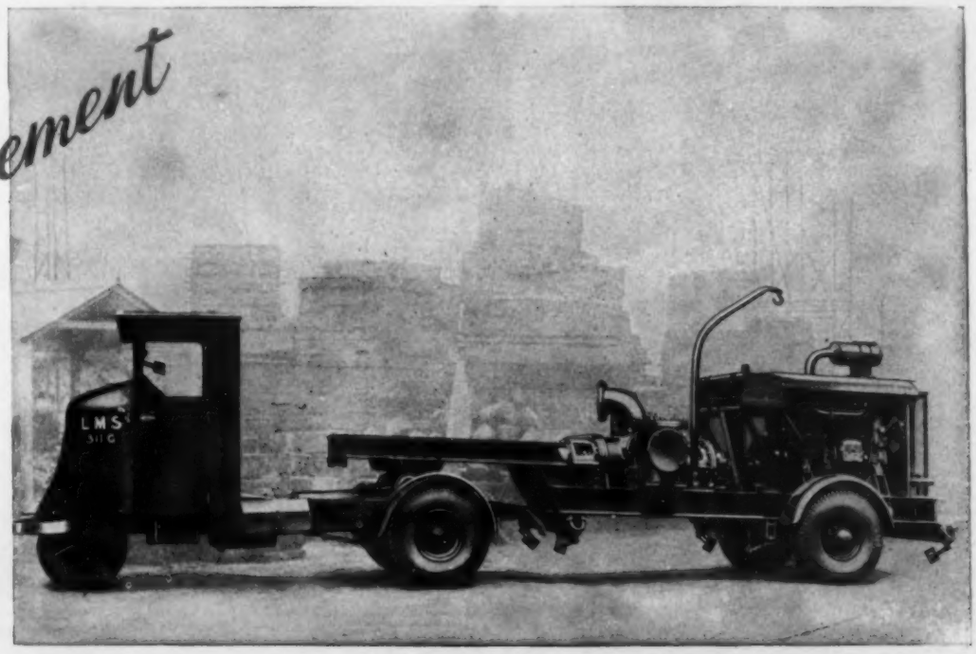

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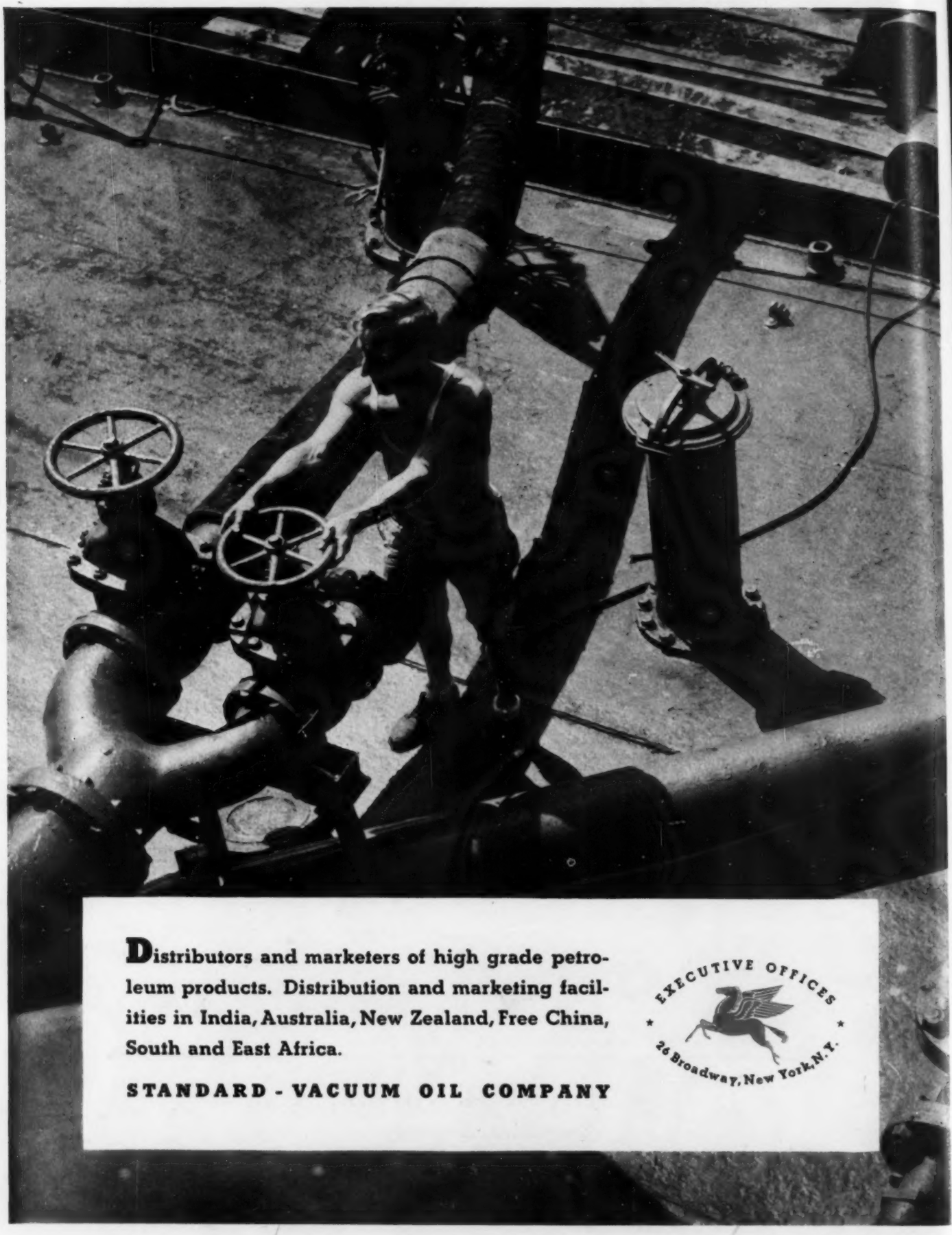

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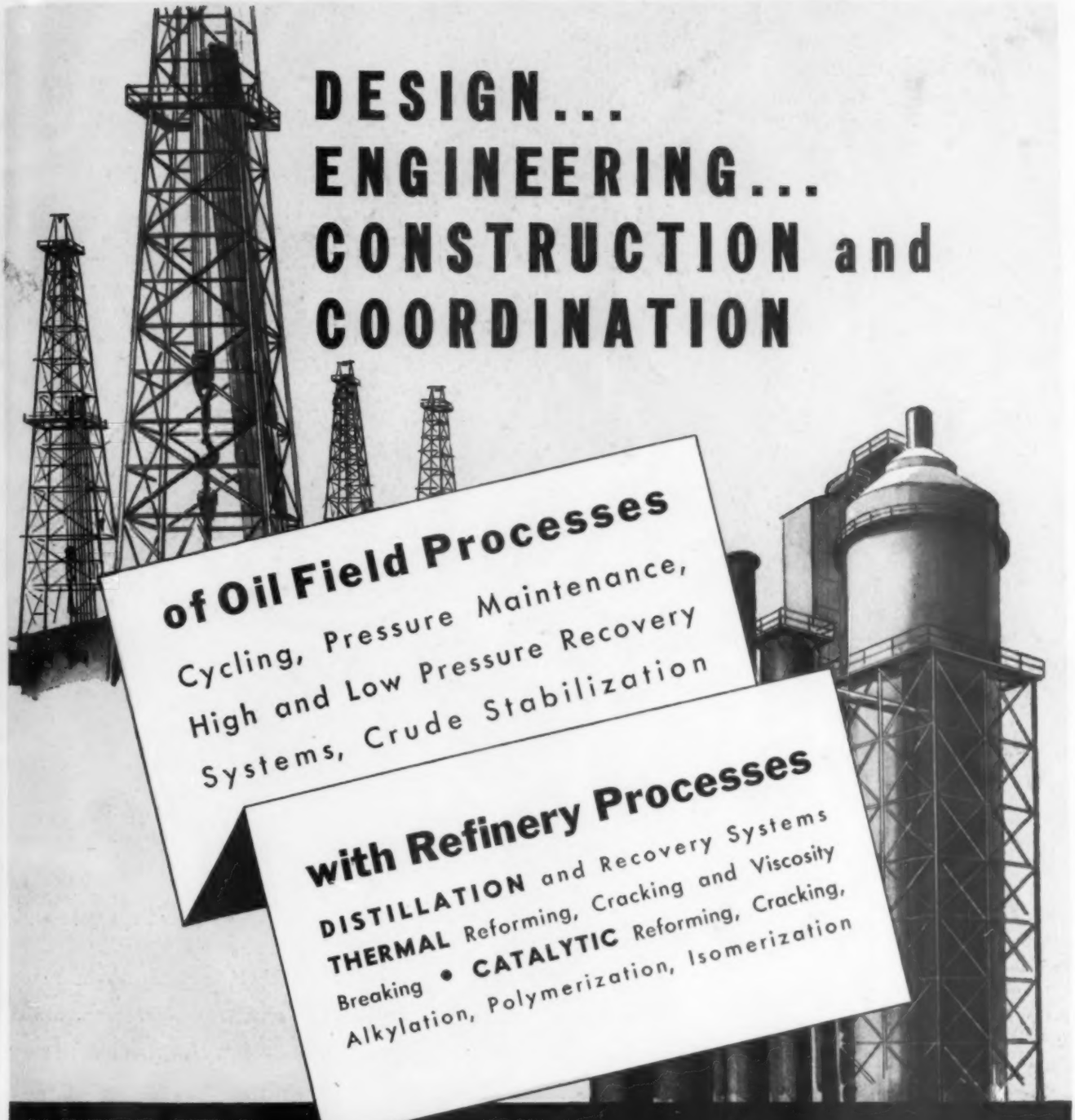

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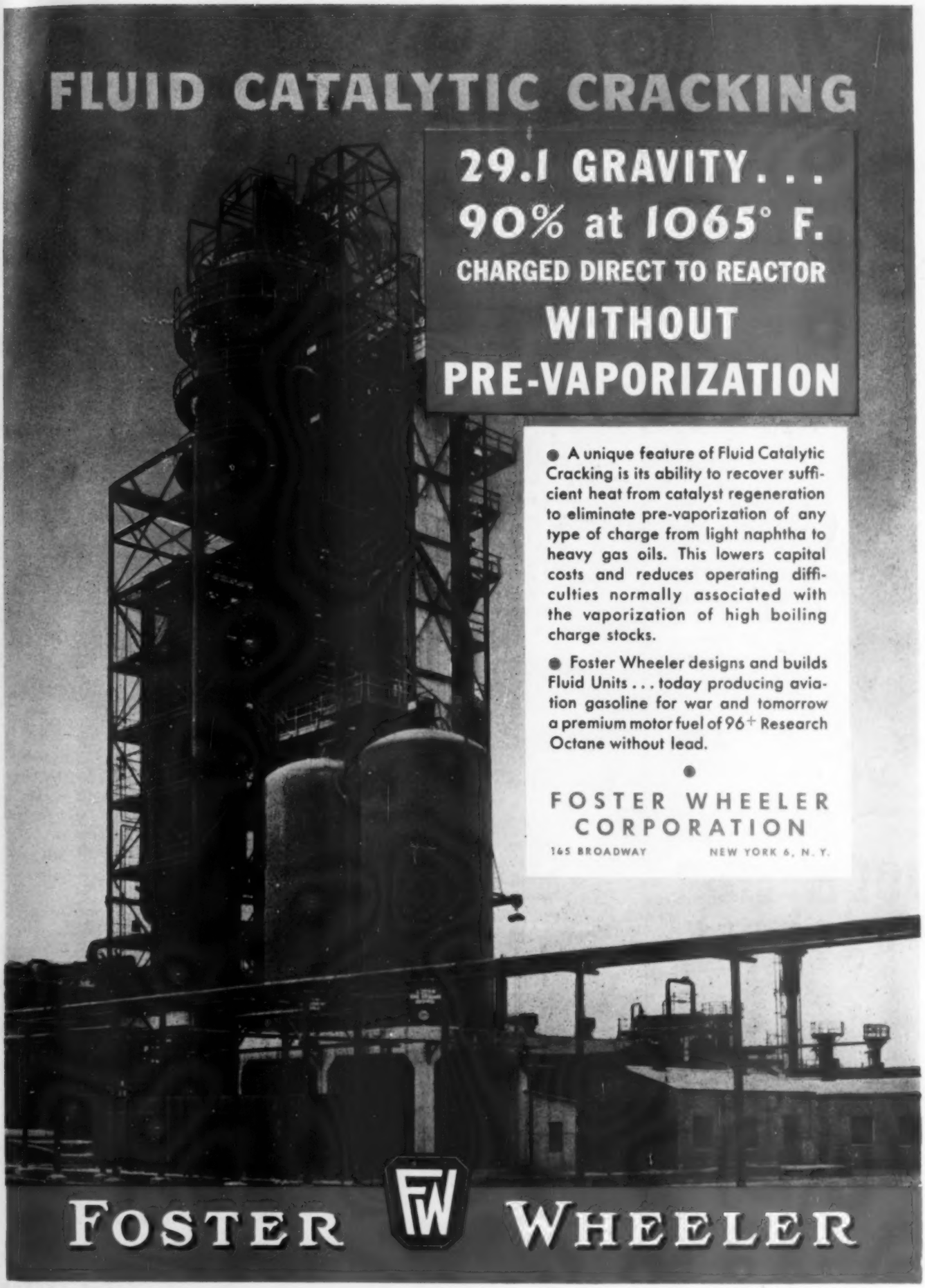
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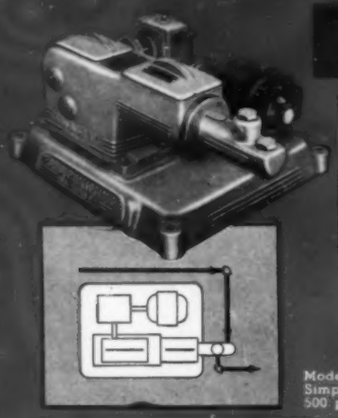

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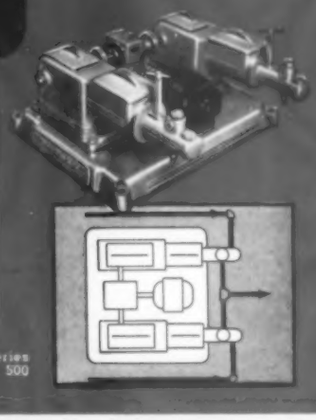

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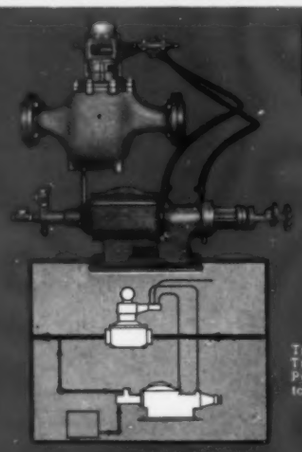

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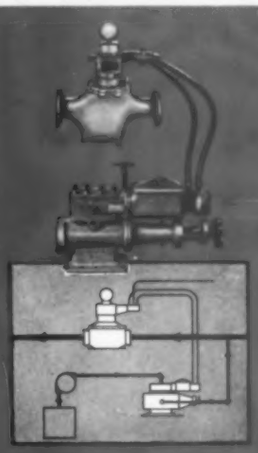

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